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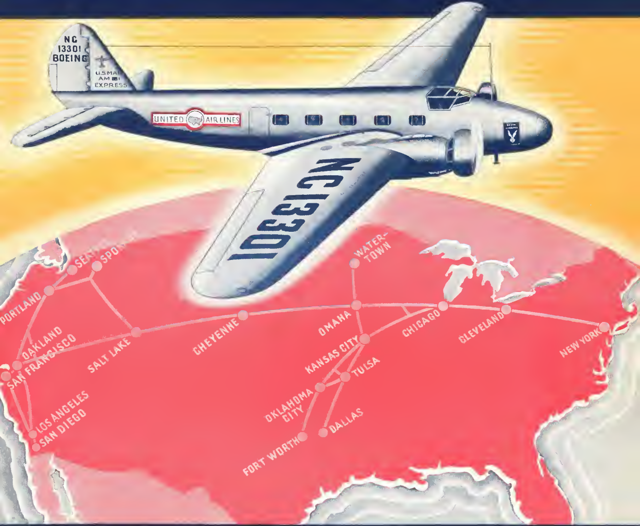

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WE DO OUR PART

AVIATION

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THE OLDEST AMERICAN AERONAUTICAL MAGAZINE

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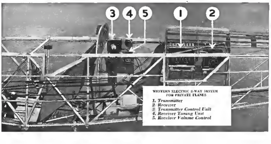


11A Radio Telephone Transmitter at left, size approximately 12" x 10" x 9". Receiver at right, size approximately 12½" x 10" x 6"

Western Electric 10A Radio Telephone Transmitter for airports. Operator with microphone extension on ramp.

AVIATION
FOR NOVEMBER, 1933

The Case for the Transport Autogiro

By *W. Laurence LePage*
Consulting Engineer, Day and Zimmerman, Inc.

WHEN the Editor of AVIATION invited me to write about large load-carrying capacity autogiros I was at first inclined to look unfavorably on the idea. Recent studies of the possibilities of large autogiros, however, have proved that this application is entirely sound and full of immediate promise. Furthermore, it now seems evident that some air transport operators are starting to look around for passenger carrying equipment which will enable them economically to tap new sources of business with which to augment present services, business which is not readily reachable with present fixed wing equipment.

The transport aircraft

To be practical and useful the aircraft for transport must be capable of carrying a suitable load at high speed economically, conveniently, and safely. It should be remembered that load capacity, speed, economy, convenience and safety are relative quantities and the basis of consideration is, in each case, very arbitrary.

For example, suppose we compare two aircraft, the one having a cruising speed of 135 m.p.h. and the other cruising at only 100 m.p.h. The first aircraft we will assume uses the regular airports and, therefore, we must count upon at least 30 minutes of ground time at each end of the air schedule in order to get a true picture of transportation time between two points. In the second case, however, the machine, we will assume, is capable of using downtown landing platforms or

some substitute such as a park area close to the center of the city In this case there will be no ground time included in the schedule Table I will show that in such a case it is in fact possible to maintain a faster schedule, and certainly a more convenient one, with the slower ship up to distances of 400 miles. Other things being equal, then, the slower machine would actually provide the faster air transportation, and from the standpoint of speed alone (to say nothing of convenience) would be the better type to adopt This merely serves to illustrate the very arbitrary basis of some comparisons and the impossibility of drawing sound conclusions without taking into account all pertinent factors

Load carrying capacity

When we consider the load carrying capacities which can be anticipated for the large transport autogiro we have plenty of data from which to predict The small autogiros built to date have proved to be good load carriers and there is nothing in the fundamental theory of lift by rotating articulated blades to indicate that this should not be so

In Tables II, III and IV, facts on load capacity have been collected for characteristic airplanes and autogiros. It will be seen that useful loads as a percentage of gross weights are not far out of line between the airplane and the autogiro The figure of 34 1 per cent for the autogiro compares with 35 6 per cent for the transport and 37 8 per cent for the small airplane.

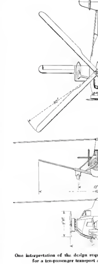
Existing autogiros have been designed on a most conservative basis of structural strength and, therefore, structural weight. This is particularly true of the rotor system and pylon, and has been due to an unquestionably sound policy of the two autogiro builders in this country to allow wide structural margins during the period of limited experience in design This period is passing and we will no longer hesitate to take advantage of the inherent characteristics of autogiro rotors, which, due to the very fundamentals of their operation, indicate elementary and very largely balanced stresses throughout

Load per horsepower

As to the useful loads per horsepower we again find workable facts, with the autogiro giving an average figure of 3 8 lb./hp., the speed transport plane 4 1 lb./hp., and the small plane (of lower speed) 5 0 lb./hp Here the question of speed begins to enter the picture and explains the lagging of the 'giro in this respect We shall come to this question of speed, but it is well to point out here that the power required for the autogiro is not based upon its load carrying capacity, and that autogiros have been overloaded in tests without any appreciable loss of speed, the rate of climb being the principal factor of performance affected This is to be expected as it would also be true in the case of the airplane

Speed

Autogiros built to date have been considerably slower than their equivalent airplanes This is not an insurmountable problem, the possibilities are by no means exhausted, and the tremendous progress which has been made in autogiro design during the past few years is indicative of no lack of competence on the part of those responsible to harness still further the very highly complex mechanics of the autogiro rotor system so that these machines will move forward with more speed and less power.



One interpretation of the design requirements set forth by Mr. Le Page for a ten-passenger transport autogiro with 700-hp. engine

Table I: Comparison of Schedule Times, Autogiro and Airplane

Assumed airplane cruising speed .... 155 m.p.h.
Assumed ground time (1 hour each end) .... 1 hour
Assumed autogiro cruising speed .... 100 m.p.h. (no ground time)

Miles	Air Time Airplane hr. min.	Total schedule Time hr. min.	Per cent of time on ground	Autogiro schedule Time hr. min.
50	0 22	1 22	73	0 30
100	0 44	1 44	57	1 00
150	1 07	2 07	47	1 30
200	1 29	2 29	40	2 00
250	1 51	2 51	35	2 30
300	2 13	3 13	31	3 00
350	2 36	3 36	28	3 30
400	2 58	3 58	25	4 00

Table II: Useful Load and Power of Airplanes—Speed Transport Types

Factor	Boeing 247	Curtiss Condor T-32	General GA 43	Lockheed Orion	Stinson "U"
Weight empty (lb.)	8,570	11,235	5 300	3 325	6,055
A Useful load (lb.)	4 280	5 565	3,200	2 075	3 245
B Gross weight (lb.)	12 650	16,800	8,500	5 400	9,300
A of B (per cent)	33 9	35 1	37 6	38 4	35 0
Power (hp.)	1,100	1 400	700	550	720
Useful load/Horsepower	3 89	3 97	4 57	3 77	4 52

Table III: Useful Load and Power of Airplanes—Small Types

Factor	Waco Cabin "C"	Waco "A"	Monocoupe	Fairchild 22
Weight empty (lb.)	1 662	1 369	1 020	1 010
A Useful load (lb.)	1 038	881	600	590
B Gross weight (lb.)	2 700	2,250	1 620	1 600
A of B (per cent)	38 4	39 1	37 0	36 9
Power (hp.)	210	170	110	125
Useful load/Horsepower	4 93	5 18	5 45	4 72

There are very definite technical reasons for expecting higher speeds of the autogiro The fully cantilever rotor, without droop or interblade cables, contributes an increase in speed of the order of 10-15 per cent. This has been proved on ships which have been flying experimentally for some time There are other engineering developments now under way which will lead to higher autogiro speeds By way of indication, it is worth noting that, whereas the landing speed of the autogiro varies with the disk area and therefore the disk loading, (just as in an airplane it is proportional to the wing area) the top speed of the 'giro is a function of the solidity which for a given design controls the revolutions per minute of the rotor There is consequently a wide range of possible top speeds for a given landing speed

Since an autogiro is in all respects very similar to an airplane except for the rotor, that part of its structure other than the rotating system is susceptible to the same methods of drag reduction as have been successfully employed to reach higher airplane speeds The rotor involves a problem of cutting profile drag (since the induced drag is in any case extremely low) and, as we find methods of doing this, so we can anticipate higher speeds Furthermore, because the air speed of the rotor elements does not increase in direct proportion to the speed of the ship, there are good reasons for believing that the autogiro becomes more efficient at the higher velocities whether these higher velocities are achieved by more power or by more efficient design.

Characteristics

Let us examine the general characteristics of a transport autogiro to fill a specific need A very likely type is shown in the accompanying diagram although there are many other interpretations of the requirements each of which would have its respective merits. This particular design, however, will indicate by example some of the problems and suitable methods for their solution

The ship is a ten-place job fitted with a 700-hp Wright Type R-1820 engine

Table IV: Useful Load and Power of Autogiros

Factor	PAA-1	PA-18	PA 19	K 2	K-3	PCA-2	PCA 2 (overload)
Weight empty (lb.)	1 150	1 354	2,700	1 518	1 647	2,093	2,093
A Useful load (lb.)	600	556	1 360	682	753	907	1 532
B Gross weight (lb.)	1 750	1 910	4 060	2,200	2 400	3 000	3 625
A of B (per cent)	34 5	29 1	33 5	31 0	31 4	30 2	42 3
Power (hp.)	125	160	420	165	210	300	400
Useful load/horsepower	4 8	3 48	3 24	4 13	3 58	3 02	3 83

In general, the design is characterized by the outrigger tail system and the location of the pilot, both of which details are novel The outrigger tail permits the adoption of a fuselage form as near to a perfect streamline as practical, especially in plan form

Since the tail loads on an autogiro in flight are small compared with those for the fixed wing airplane, the tail supporting structure is designed by the landing condition. In a ship of this size it seems advantageous to relieve the tail of all landing loads and design the structure solely for the flight condition

By moving the tail wheel forward to the extremity of the short fuselage, it is practical to include a tail wheel brake since the weight carried on this wheel is appreciable—1,600 lb in the case under consideration

The pilots cockpit is located in the pylon structure, this location being admirable from the standpoint of vision Furthermore, the high location of the pilot permits the variable passenger load to be moved further forward, reducing the fore and aft movement of the center of gravity for changes in the payload This will be a vital matter in the large autogiro design for there are structural limits within which the rotor may be mechanically tiltable longitudinally, and a restricted C G movement is therefore highly desirable

The necessity of arranging a tilting mechanism for the rotor structure is in fact the controlling element in the height of the pylon structure in an autogiro of this size Propeller clearance ceases to be an influence on the problem but fin clearance constitutes one of those annoying little details which so often prevent the designer from carrying through a scheme to its logical conclusion.

A device for eliminating this problem is under consideration and if it is adopted will permit a considerable reduction in the overall height of the ship In the present case the rotor could be lowered by approximately 2 ft., which would bring it slightly higher than the top of the pilot's cab, resulting in a marked cut in frontal area and a general improvement in appearance

The characteristically wide undercarriage of the transport autogiro is retractable. The purpose is not so much to reduce the head resistance as to cut down the interference drag due to the close proximity of the wheels and twin shock struts to the under side of the stub wing

Size of the rotor

One of the most discussed questions pertaining to the large load carrying autogiro is that of the rotor and its size It has been felt that the diameter of the rotor would have to be excessive and that the ship would therefore become quite unwieldy This, however, is not the case for scale effect is very much in our favor as the size increases and it will be both practical and, I believe, essential, to operate with heavier disk loadings than have been considered advisable in the smaller ships

To analyze this phase of the subject an extensive study of the theory has been made as it applies to large diameter rotors of conventional loadings and somewhat smaller rotors of slightly heavier disk loadings. Results indicate distinct ad-

vantages in increasing the loading even though this entails increasing the minimum permissible horizontal speed and, proportionately, the rate of vertical descent. In the latter connection it is important to realize that there is a very marked ground effect when the rotor is within one and perhaps even two or more diameters of the ground. While this has never been measured, its presence is indicated by practical results.

Due to the higher peripheral velocities (Ω) of large-diameter rotors and the advisability of maintaining an efficient value of the important ratio $^{\Omega}V$, these rotors turn considerably slower unless speeded up by either reduced pitch (which has not so far been resorted to but the possibilities of which will have to be investigated) or increased disk loading. This introduces the problem of stabilizing, in the plane of rotation, these very large rotors under the influence of the reduced centrifugal forces coupled with lower pendular frequencies, and this problem may become the controlling element in the choice of rotor diameter for larger ships.

Disk loading and solidity

Some indication of the problem will be gained from a study of Table V which shows the important performance variables of the autogiro and how they are influenced by the principal design variables of the 'giro, namely disk loading $(W/\pi R^2)$ and solidity (σ). These figures should not be taken as indicative of the performance of any particular autogiro, either built or projected for they are purely relative, pertaining to a series of hypothetical design combinations. The figures represent the relative performances which might be expected from the adoption of various disk loading and solidity combinations (some of which, as indicated, have been used in existing small ships and on which therefore, practical experience as to behavior is available) for a large design with rotors of diameters ranging from 60 ft. to 82 ft.

From this table it will be seen that, generally speaking disk loading/solidity combinations which are in vogue today are not altogether suitable for the projected large rotors simply because such rotors will not turn at speeds sufficient to permit adequate dynamic stability of the individual blades about their vertical hinges and in the plane of rotation. It should be remembered that this problem of stabilizing the movement of the individual blades in the plane of rotation resulting from what Senor de la Cierva terms the "kinematic oscillations" in the plane of flapping, involves one of the several highly complex mathematical maneuvers entering into autogiro design, and is only practical within fairly narrow limits.

It seems, therefore, that a rotor diameter between 60 and 64 ft. and a solidity of .065 for the ship under discussion will be the best compromise in spite of some loss in climbing and ceiling performance. Perhaps the 67 ft. diameter would be better, but in this case the solidity must be dropped to .050 which will probably entail scrapping one blade for structural reasons, using a three bladed rotor. A sample performance indicating what might be expected of a transport autogiro of the type under consideration, has been calculated using a combination of the standard airplane method and the especially adapted method given in Senior Cierva's "Theory of the Autogiro." A 64-ft. rotor diameter having a solidity of .065 has been taken for this performance calculation, the results of which are given in Table VI.

Here is an entirely practical set of performance figures of real transport value. Such a ship would not be intended as a competitive type with present transport equipment but rather as a machine capable of augmenting existing schedules with feeder and shuttle line service in a manner not possible with the airplanes in transport use today.

In conclusion, it seems appropriate to stress the fact that the realization of the transport type autogiro is very largely a matter of demand.

No insurmountable engineering problems now stand in the way of its realization and, when the transport autogiro does materialize it will serve a tremendous economic need in broadening the present useful scope of air transportation by augmenting, not replacing, present equipment and services.

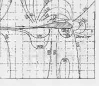
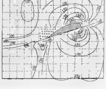
Table V. Effect of Disk Loading and Solidity on Performance

		PA-18 PAA-1 K-2	K-3 PCA-2 PA-19	PCA-2 (overload)		
	Diameter	62 ft.	72.5 ft.	67 ft.	64 ft.	60 ft.
	$W/\pi R^2$ \ σ	1.55 (1.55–1.67)	1.90 (1.82–1.96)	(2.26–2.32)	2.55	2.90
	.050		V_{min} = 37.2 V_s = 21.7 v_t = 723 h = 14,800 n_1 = 96	(Three bladed) V_{min} = 40 V_s = 23.2 v_t = 692 h = 13,400 n_1 = 111		
	.065				V_{min} = 40.8 V_s = 25 v_c = 668 h = 12,600 n_1 = 108	V_{min} = 43.5 V_s = 24.6 v_t = 623 h = 11,700 n_1 = 123
PA-19	.082		V_{min} = 34.8 V_s = 19.5 v_t = 723 h = 14,800 n_1 = 74		V_{min} = 36.6 V_s = 22.25 v_c = 668 h = 12,600 n_1 = 96	V_{min} = 42.1 V_s = 23.7 v_c = 623 h = 11,700 n_1 = 110
PA-18 PCA-2 PCA-2 (overload)	.099	V_{min} = 29.8 V_s = 16.8 v_t = 774 h = 16,600 n_1 = 68	V_{min} = 33.7 V_s = 19.0 v_t = 723 h = 14,800 n_1 = 67			
PAA-1 K-2 K-3	.107					

V_{min} = Minimum horizontal speed, sea level (m.p.h.)
V_s = Vertical descent speed (ft./sec.)
v_c = Rate of climb, sea level (ft./min.)
σ = Solidarity
h = Absolute ceiling heavy (ft.)
n_1 = Rotor r.p.m. light.
Ω = Peripheral speed of blades.

Table VI: Performance of Transport Autogiro

Ref	Item	Light	Heavy
V_m	Maximum horizontal speed, sea level (m.p.h.)	140	133
V_{min}	Minimum horizontal speed, sea level (m.p.h.)	26.8	40.8
V_1	Best climbing speed (m.p.h.)	84	84
v_c	Rate of climb, maximum sea level (ft./min.)	1,347	668
h	Absolute ceiling (ft.)	22,100	12,600
V_s	Vertical descent speed (ft./sec.)	18.7	25.0
n	Rotor r.p.m. sea level	108	124

The results of an investigation by A. La Presle. Fig. 1 (left): Typical velocity distribution around an airfoil. The figures on the curves represent the ratio between local velocity of the air and true velocity of the wing. (4-deg. angle of attack). Fig. 2 (right): Typical velocity distribution. (16.5 deg. angle of attack).

Improving Airspeed Accuracy by Pitot Tube Location

By George Tate, Jr.
Formerly of Pioneer Instrument Company

IN THE United States, the pitot-static type of Airspeed Indicator is in almost universal use. Speed indication is obtained by measuring the difference between the pitot (or dynamic) pressure caused by the impact of the air, and the static pressure (pressure of still air). The indication can be a true measure of air speed only if the pressure *at the pitot* is the true dynamic pressure caused by the forward velocity of the airplane, and the static pressure is the true static pressure of the atmosphere. In view of the influence of the wing and structural members on the airflow about them, it is evident that the location of the pitot tube is highly important. If the tube is located in a region of disturbed air, or is not parallel to the relative airflow there is no chance for an accurate indication.

The series of curves accompanying this article are correctly called "Isovels" meaning lines of equal velocity (not to be confused with flow lines around an airfoil). The figures on the curves represent multiplying factors showing the relation between velocity of the air in the region of any particular Isovel, and true velocity of the wing through the air. These particular curves are the result of an investigation made by A. La Presle in France, and apply directly to one of the Joukowsky airfoils of moderately thick section. Due to structural considerations the Joukowsky series of airfoils have never been widely adopted, although their characteristic of a deep leading edge of a large radius has formed the basis for many of the better known sections in use today.

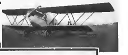
From a study of the curves, it is apparent that the number of satisfactory pitot tube locations in the vicinity of a wing is extremely limited from an aerodynamic standpoint. The correct location for the tube at any pre-determined angle of attack, would be parallel to the airflow in the region of a unity isovel. For a satisfactory installation for any flight condition from the stall to the glide, the correct location would seem to be at the intersection of the unity isovels for the corresponding widely different angles of attack. The accompanying curves reveal only one such intersection—a point approximately 25 per cent of the chord to the rear of the trailing edge and 35 per cent above. Installations at this location have been made on ships equipped with the Gottingen 387 wing, and others with the Clark Y with extremely satisfactory results for all conditions from the stall to the glide. Although it is more difficult to make an installation at this point than in the conventional position directly ahead of the wing, the location has a number of advantages and is especially good for monoplane flying boats or low wing monoplanes.

In the case of biplanes, the normal pitot location on one of the outer interplane struts is generally satisfactory if the pitot is placed at 50-66 per cent of the gap, above the lower wing. The two factors to be considered are that a reduced pressure and increased velocity exist above the lower wing, and increased pressure and lower velocity beneath the upper wing. How sharp the line of demarcation is and where it occurs cannot be definitely stated, for it depends upon airfoil section, gap, stagger, etc. In the case of a popular make light biplane in which the gap and chord were approximately equal, the pitot location was found to be quite critical. At one point a movement of 2 in. down from a previous location near the half-way mark on the strut, changed the readings as much as 4 m.p.h. under identical conditions.

The fact that the tube must be approximately parallel to the airflow is self evident. A small deflection from parallelism (+ or — 5 deg.) will not affect the accuracy of the readings and it is satisfactory for all practical purposes if the pitot tube be aligned with the thrust line of the ship.

War veterans

Top, left: Before D'Annunzio's raid on Vienna—the S.V.A. as a single-seat fighter (1917). Above: After the transformation—the S.V.A. becomes the standard for two-place reconnaissance (1918). Left: The Fiat R 2 of the last stages of the War (1918).



Italy's Eyes of the Air

Modern types evolve

Above left: Replacements for the S.V.A. in 1922, the Fiat A 300/4, later to become a school machine for advanced training. Above, right: The R-22 of 1925 by Fiat, related to the famous B R series day bomber. Above: The monoplane appears in the Fiat A-120, a type that remained in active service through 1932. Left: One of the latest—the Caproni C-111, designed as a land plane, but here shown on floats.

In the October issue of AVIATION Commander Scaroni, pursuit ace during the War, onetime Air Attache at the Italian Embassy at Washington, and now on active service with the Italian Air Forces, began a discussion of Italy's Air Fleet with a study of the bombardment arm. In this, the second of three articles, the discussion turns to observation and reconnaissance types both on land and sea.

The Equipment of Air Forces

ITALY (PART II) OBSERVATION AND RECONNAISSANCE

By Comdr. Silvio Scaroni

IN THE very early days of military aviation, the airplane was limited in use to observation and reconnaissance. Few airplanes of the period could do much more than stagger off the ground and it was thought improbable that any effective quantity of guns, bombs or ammunition could ever be carried. The story of early observation types in Italy is, therefore, the story of the airplane itself.

Turning back the pages of history we find the names of Faccioli who built a successful triplane about 1908, and Cobianchi who, with Faccioli, entered planes in the Aerial Circuit of Brescia in 1909. A little later two other names appear, long since familiar in the aviation world, Marchetti, designer of the famous S-55, and Caproni whose machines have for many years been the backbone of the Italian bombardment services. Macchi, whose design now holds the world's high-speed record, designed and produced a parasol type monoplane with which two of the half dozen squadrons were equipped which went to the front at the outbreak of the War in May, 1915.

As in the case of bombardment machines, however, Italy had no adequate design or production facilities for reconnaissance planes at the outbreak of hostilities, and had to rely upon her allies for equipment until Italian production caught up with the demand. Farman, Nieuport, Caudron, Voisin, and other designs were imported, and an Italian Company (S.A.M.L.), produced a machine which was a copy of an Aviatik captured intact from the Austrians.

As far as engines were concerned, the situation was decidedly better, for the Italian automobile industry was soon in position to supply satisfactory engines for aviation work. In 1915 the Fiat concern produced the A 10, a 100 hp. plant with which the early Caproni bombers were equipped. The same year Isotta Fraschini brought out the V 4, a six-cylinder engine of 150 hp. 1916 saw three new engines, the Fiat A 12 of 240 hp., the Isotta Fraschini V 5 of 200 hp., and the Colombo, 110 hp. All were of the water-cooled in-line cylinder type. The peak of the War-time designers' output occurred in 1917 when five new types appeared. Another well-known automobile company, the S.P.A., entered the field with the 6 A, an engine of 200 hp. Fiat brought the A 12 series up to 300 hp., and brought out a new A 14 engine of 600 hp., Isotta Fraschini produced the V 6 of 250 hp., and Colombo pushed his engine up to 150 hp. with a new type E. Italy thus had airplane engines available as the needs arose for machines for various purposes, first the bombers in 1915 with the tri-engined Caproni, reconnaissance in 1917 with the S.V.A., and last of all, the pursuit in 1918, with the Balilla.

For service at sea

Below: The S.59 type accepted in 1927 as standard equipment for naval observation squadrons. Below right: The S.62 of 1932 of the same type as S.59 but improved in detail and in performance.

War-time observation planes

The earlier observation types were built around the Fiat A.12 engine of which some 3,400 units were produced. Four distinct types appeared with this power plant, the S.P. of 1916, the S.P.3, the Pomilio and the SfA.7, all in 1917. The S.P. type was not original, but was a hybrid resulting from Caudron, Voisin and Farman types. The Pomilios and the SfAs although not extraordinarily good, represented a step forward in Italian design and were the last to show foreign influence. They yielded in 1917 to an all-Italian designed and built machine, the S.V.A.

Two officers of the Italian Air Force, Engineers Savoia and Verduzio, were

responsible for the design of the new reconnaissance plane The designation S V A was derived from the name of the manufacturer, the Ansaldo firm of Geneva. The first squadron with the new equipment was organized in 1917 with the present writer as one of the pilots The machine represented not a step, but a jump forward in the advancement of military aeronautical construction Even today, the S.V.A. may still be rated as a modern machine in the 200 hp. field

As originally produced the S V A was a single seat fighter but the desire of D'Annunzio, who was not at that time a pilot, to command personally a raid over Vienna, began its transformation into a two seater. In the D'Annunzio machine, the gasoline tank was modified to permit the placing of the extra seat The performance of the machine with the additional load was so good that the design was changed so that a gunner-observer, could be carried regularly behind the pilot. Ansaldo produced some 1,300 of this type Although one other observation ship appeared before the end of the War, the R-2 by Fiat, its performance was not sufficiently good to warrant extensive replacement of the S V A, and the latter type remained the backbone of Italian reconnaissance until the end of the War

Although designed in 1917 the S.V.A. had many features which characterized modern military design It was a thin-winged tractor biplane, fitted with a single SPA type 6-A engine of 200 hp. The cellule was of characteristic design, with N type struts [It should be noted in this connection that N struts in Italian designs lie in planes normal to the thrust axis Compare American and British practice in which the so called N struts lie in planes parallel to the line of flight.] The control wires to the tail units were run entirely inside the fuselage. In section, the fuselage was rectangular to a point just aft of the cockpit and became triangular from there to the tail Wings and tail surfaces were fabric covered.

Procurement practice

Before going on with the discussion of the more modern equipment of the Italian Air Forces, it may be well to introduce a few paragraphs outlining the relationship which exists between the Italian Government and the producers of military aircraft Up to 1923 when the Independent Air Force was created the private producers were virtually in a position to dictate the specifications covering military airplanes and engines With the establishment of the Air Ministry, however, a competent body of technicians was assembled who were thoroughly familiar with military requirements and production difficulties and thereafter the constructors although retaining a certain latitude with respect to detail, were required to follow certain general regulations laid down by the Air Ministry

Name	Year of Construction	Engine	Horse-power	Weight Empty (lb.)	Useful Load (lb.)	Maximum Speed (m.p.h.)	Service Ceiling (ft.)	Range (hours)
OBSERVATION AND RECONNAISSANCE								
S.V.A. 5	1917	Spa 6.A	205	1 545	496	133 6	17 700	3.00
S.V.A. 10	1918	I F 250	250	1 676	772	127 4	19 000	2-45
R.2.	1918	Fiat A 12 bis	300	2 756	992	108 7	16 400	3 00
A 300/4	1923	Fiat A 12 bis	300	2 646	1 102	126 8	21 300	3 30
R. 22	1925	Fiat A.22	550	3 543	1.984	150 4	19.600	3 30
A. 120	1926	Fiat A 22	550	3 151	1 984	152 2	22,300	5 10
Ca. 111	1932	I F A 750 R	850	6 400	4 960	154 1	19 800	7 10
Ro 30	1932	Jupiter VIII	500	3 375	2,315	161 6	22,900	8 00
SEAPLANES								
S. 59 bis	1927	I F Asso 500	500	4 139	2,205	130 5	14 300	5 00
S. 62	1930	I F Asso 750	750	5 663	5 252	139 8	16 400	[illegible]
S. 78	1932		850	6 404	5 071	154 1	15 150	14 00

The technical staff of the Air Ministry is divided into two separate branches, the Experimental and the Construction Divisions, each headed by an engineer with the rank of General. The latter division is in direct touch with the industry and maintains a corps of inspectors in the plants of the various producers to insure that all specifications are followed. Since the government is the principal customer of the aeronautical industry in Italy (as in most other countries), the opinion of the technical staff carries great weight with the industry

The Royal Air Force obtains equipment in several different ways The most common system is to invite several firms known for their capacity to produce specific types, to enter a design competition against a certain set of specifications issued by the Construction Division When the drawings are presented, they are carefully examined and one or more designs selected. A corresponding number of prototypes are then built Once constructed, the machines are sent for test to Montecelio (for landplanes) or to Vigna di Valle (for seaplanes) Since the airplanes do not as yet belong to the Government the preliminary trials are made by the constructors, pilots and engineers. A duplicate set of tests is then made by military pilots and if the data so obtained correspond to contract specifications, the plane may be accepted A few machines are first ordered for service tests with active squadrons and, if no difficulties develop, they may then be ordered in quantity The practice of creating separate experimental squadrons to service test new types has not been generally adopted

Sometimes the competitive feature is omitted, and firms recognized as capable of building the type of plane required are simply asked to present drawings against the set of specifications set up by the Construction Division. Once the first planes are delivered the procedure for acceptance is as outlined above

Finally, all manufacturing firms are authorized to request the Air Ministry to send to experimental fields any planes designed and built on their own initiative and risk If such machines show any features of military interest they may be accepted and bought, even if they do not entirely satisfy the current service requirements. If machines are flatly rejected the manufacturer must pay for the total cost. One of the most notable examples of this sort was the presentation of the S.55 by Savoia Marchetti, built entirely on speculation, and later accepted in large quantities by the government

Once a production order has been received, it is permissible for the constructor to sub contract certain parts of the order. This system had its origin in national emergency conditions Subcontractors, however, must pay the original producer a fair royalty on each plane built

Early post-war period

The political disorder which followed the War retarded development of new airplane or engine types until well into 1923. During that year Fiat produced the Model A 300/4 biplane built around the War-time A 12 engine of 300 hp Six hundred such machines were built as a stop-gap for the immediate use of the Italian Squadron who by that time, were practically without usable flying equipment Somewhat later the Fiat A.20 engine, 410 hp, was substituted for the A 12, but the performance of the machine (the A 300/6) did not come up to this expectations of the military authorities and it was relegated to the schools for advance training purposes

Engine development was again getting under way, however, and it was not long before the Fiat A 22 appeared, an engine which developed a maximum of 620 hp at 2 100 r p m with a dry weight of approximately 1,000 lb With

this new power plant on hand, two new reconnaissance planes put in an appearance, the R.22 in 1925 and the A 120 in 1926. Both were products of the Fiat organization, the first engineered by Rosatelli, famous for his success with the B.R. bomber (see AVIATION, October, 1933, page 315). It differed from the B.R. series, not only in general arrangement, but also in structure, being built entirely of tubular steel Its range of three hours 30 minutes was considered unsatisfactory from a military standpoint, however, and it was gradually pushed out of service by the A 120

The A 120 represented an entirely new departure for Italian airplane design, a monoplane of the parasol type, with framework constructed entirely of metal, fabric covered. Its performance for altitude, speed and range was so good that it remained in active service until 1932 in spite of the serious efforts to displace it in 1927 and 1928 by Breda and Romeo

Modern trends

Modern military tactics contemplate reconnaissance flights of very long range, and the comfort and convenience of the crew as well as the necessity of complicated navigation by astronomical observation and the use of large charts dictate closed cabins rather than open cockpits. In line with such requirements, the specifications laid down for long range observation ships by the Italian Air Ministry have been met in such ships as the Romeo 30 and the Caproni 111, a biplane and a monoplane respectively, but both having fully enclosed cabins.

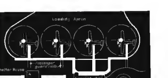
The RO-30 is designed for a crew of three. The fuselage is of rectangular cross-section of welded tubular steel covered forward by duralumin sheets, and aft by doped fabric The wings are of wooden construction, partially covered with plywood and partly by fabric. Both upper and lower wings are made up in one piece and are geometrically similar although the lower is considerably smaller than the upper The 500 hp Jupiter engine (reduction gear 2 1) permits the top speed of 161 6 m p h Tankage is sufficient for eight hours at cruising speed

The CA-111 by Caproni of bombing fame is a high wing monoplane which follows the Bellanca pattern rather closely. Structurally, it is similar to the RO 30 having a tubular fuselage and wooden wing Both pilot and observer have exceptionally good fields of view The engine is an Isotta Fraschini of 850 hp With a full load of gasoline, this ship has a duration of 11 hours at cruising speed It may also be converted into a light bomber With reduced tankage and with a normal load of light bombs it has a duration of seven hours

Observers go to sea

In 1911 General Guidoni, then a captain in the Naval Construction Division, made some flights in a seaplane of his own invention and later (1914) succeeded in launching a torpedo from an Italian-built seaplane designed by Pescara and Pateras. When Italy entered the World War a Lohner seaplane captured from the enemy in 1915, served as a sample from which the now famous firm of Macchi built a number of machines which were used for naval observation and anti-submarine work It was not until well after the War (1920) that Macchi produced the M 18 built around the 250 hp V 6 Isotta Fraschini engine. This machine gave a fairly satisfactory performance but followed very closely the design and construction adopted in the earlier ship, that is, it was a flying boat with the rigid biplane cellule, adjustable struts and pusher propeller About the same time the firm S I A.I (now best known for the production of the S 55 flying boat bombardment type), produced a seaplane for civil purposes which was easily transformed into a military machine Work on this type was so far advanced that a modification of the original model (the S 19) was able to win the Schneider Cup of that year, at an average speed of 107 2 m p.h. This machine attained a top speed of 137.9 m.p.h Since the type seemed well adapted to the needs of the Navy, a period of intensive development followed which resulted in the evolution of the S 59 which was then accepted as the standard machine for the naval observation squadrons.

The S 59 was a flying boat of the conventional type with sufficient fuel capacity for seven hours flying at a cruising speed of 118 m.p h During the several years this machine was in active service, several modifications in engine power and arrangement of accommodations for pilot and observer were made, the final results being the S 62 flying boat fitted with an Isotta Fraschini water-cooled engine of 750 hp A number of these machines were sold to Russia and several service squadrons were supplied before further modification in design justified its abandonment and replacement by a newer machine the S.78 Power was brought up to 850 hp and speed was increased about 15.5 m.p h, and the duration with full load extended to about fourteen hours This latest machine has been accepted by the Navy and now constitutes the regular equipment for service squadrons.



Turntables permit berthing of four planes at once at Port Columbus

Docking Airliners

INCLUDED in the program of improving the terminal facilities at Port Columbus is the installation of four docking turntables designed by Superintendent William F Centner Each turntable consists of a circular steel plate (4 ft 6 in diameter) mounted on a ball-bearing pivot, and set flush with the surface of the loading apron. On top of each plate a collapsable chock is mounted Approaching the loading points, pilots follow a guide line which brings one wheel of the landing gear onto the center of the turntable plate against the chock By gunning the opposite outboard engine the ship may then be pivoted about in its own length to any desired loading position A yellow ring painted on the apron indicates the clearance required for the tail of the ship in making turns When ready to depart the plane is headed about in the proper direction and the chock plate collapsed so that the wheel may run off the turntable Chock latches are released by pulling a rope

The LZ-129, newest and largest of the Zeppelin line, is rapidly approaching completion at Friedrichshafen, Germany, and should be ready for active trans-Atlantic passenger service next summer. First-hand impressions of the ship are presented herewith by Mr. Lambrecht, who has recently returned to the United States after a visit to the Zeppelin plant in Germany.

Zeppelin's New Airliner

By Wolfgang Lambrecht

Manager, Aeronautical Division, Hamburg-American Line

HAMBURG AMERICAN LINE

Dinner being served on the Graf Zeppelin over the South Atlantic to the author and Mrs Lambrecht

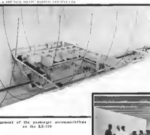
ON SEPT 18 of this year the Graf Zeppelin completed five years of passenger mail and freight service proving her worth Her spectacular flights have led to regular and unostentatious trips across the South Atlantic between Germany and Brazil These trips are now commonplace and are undertaken by average passengers seeking a quick and agreeable mode of transoceanic travel They have ceased to appear in headlines and are relegated to occasional small paragraphs buried in a mass of obscure items

The builders of the Graf Zeppelin were men of vision who realized even during her construction that the limitations under which they worked would make this craft an experimental ship the design and construction of which would soon become obsolete Had they been able to build a hangar first instead of adapting the size of the ship to the one available at Friedrichshafen they would have constructed the Graf Zeppelin much larger and thus fitted her better for the task in mind—oceanic travel It is one of the marvels of zeppelin maneuvering that in all this time the crew has been able, without accident, to dock the dirigible in a hangar not more than 3 ft higher than the ship itself! These limitations no longer exist, and so the Germans have set about the construction of a craft whose size will place it out of the realm of experiment and whose equipment and accommodations will make it a commercial undertaking of assured success—the LZ-129 Construction of the ship, designed by Ludwig Duerr, was started in February, 1932 Tests are scheduled for the Fall of 1934

A mere glance into the giant hangar at Friedrichshafen will convince the visitor that the new craft will surpass all previous models. Its enormous skeleton suggests collossal dimensions. The huge middle ring towers 134 ft. There are to be 15 main rings and 32 auxiliary rings, forming 16 compartments for as many gas cells Completed, the giant will loom 145 ft. from gondola to shell top, and its length will extend 812 ft Its capacity will total 7,070 000 cu ft, making it the largest lighter-than-air craft. The frame is constructed of longitudinal and transverse girders of duralumin, the whole structure strengthened with wire, and follows standard Zeppelin practice The rings in the cross-section are 36 angled polygons The covering will be doped with an aluminum powder to minimize the effect of heat rays Once covered her bulk will be equalized by the stream lines of her construction and, although less slender than the Graf Zeppelin, she will appear quite proportional Gas bags will not be of goldbeaters skin as heretofore, but of a gelatinoid film material, specially fabricated

The sixteen gas compartments may be filled with helium, although this expensive gas need not necessarily be used. It is likely that trial flights will be made with hydrogen, which has a greater lifting capacity, and the danger of accident is practically obviated by the fire proof construction of the ship The engines are hung on the outside as in the Graf Zeppelin, since this arrangement gives greater space in the ship and the resistance is not considerable Additional safety is gained by providing the individual gas cells with valves In practice it is possible that helium will be used to inflate the outer cells and only the inner cells may contain hydrogen. These would then be protected by the helium cells, and in case of necessity the hydrogen could be allowed to escape without any considerable expense Thus safety would not be sacrificed and a considerable saving in operating cost would be effected Moreover, a slight increase in lift would be gained

The engines, as has been suggested, are suspended from the ship Each engine is a unit in itself and carries all the necessary equipment for successful operation They are accessible from lateral gangways which also serve for storing oil and gasoline The diesel engines operate on crude oil stored in the keel in a great number of individual containers connected to a distributing system extending the entire length of the ship The fuel load will amount to some 130 000 lb The use of crude oil is of inestimable value as a safety factor and is calculated to save seven to eight long tons of fuel The motors total 4,400 hp The dirigible will be able to travel 8 000 miles without refueling and will maintain a cruising speed of 80 m p h



Arrangement of the passenger accommodations on the LZ-129

An innovation in passenger zeppelins—the smoking room

The "A" deck, social hall, and starboard promenade of the LZ-129.

The ship will be able to accommodate 50 passengers and 10 tons of payload in addition to its crew of 35 In case of necessity the passenger accommodations can be increased to give quarters for 80 persons In North Atlantic service this ship would be able to travel from coast to coast in 40 to 42 hours eastbound and in 60 to 65 hours westbound.

Great care and study has been devoted to the construction of cabins and social rooms Thus, unlike the Graf Zeppelin, the LZ-129 has its control and navigation compartments entirely separated from those frequented by the passengers The pilot's bridge, which is 10 ft in length, will be housed in the bows with a radio room above it. In contrast to the Graf Zeppelin, the main gangway of the LZ-129 will not be in the lower third of the hull but at its midaxis

Sleeping accommodations larger and more comfortable than those of the Graf Zeppelin, which had only one small salon and twelve cabins, have been provided. The LZ-129 will have two larger groups of parlors including two promenade decks and 25 staterooms with 50 beds The LZ-129 thus has four times as much room for its passengers as the Graf Zeppelin, or a total floor space of 5,380 sq ft, and fully one half of this space is available for social gathering The special smoking room in the new ship will be a feature for the traveling public, since smoking was necessarily prohibited in the Graf Zeppelin

Arrangement and decoration of the passenger accommodations is especially noteworthy and Professor Fritz August Breuhaus of Berlin has been entrusted with this most important task No pains have been spared in arriving at the most purposeful and at the same time most decorative arrangement. The difficulty of the task lay in establishing first of all, a basic principle of "air architecture," for it was necessary to combine the utmost economy of space and weight with a form at once pleasing and serviceable Every superfluous ounce was to be regarded as dead weight, and every unnecessary square inch as a grave cramping of costly space.

Next to the control gondola there are four long rows of windows which belong to the two 45 ft. promenade decks The passenger rooms lie completely separated from the gondola entirely in the inside of the ship in two decks—one above the other. The main deck contains the roomy dining hall with 38 chairs; adjoining is the promenade with large windows On the starboard side is the social hall and the neat writing and reading room; further, the second promenade Amidships lie the 25 roomy staterooms, which can be used singly or doubly and are furnished with running hot and cold water

On the lower deck are located the kitchen with its electric stove and kitchenette equipment, the officers' and crew's quarters, the chief steward's office, bathrooms, toilets, and the spacious smoking room *A* and *B* deck are connected by a broad staircase Entrance is made by stairs which can be drawn into the body of the ship

An inspection of the passengers' quarters will reveal extreme simplicity of form The graceful metal furniture, the choice of colors at once restful and cheery, the constellations of the northern and southern heavens with astronomical precision, the graphic presentation of the historical development of the airship, and a panorama of the route traveled in bird's-eye view constitute the decorative scheme

Combined then, the size of the craft, her newest mechanical features, and the spacious, comfortable, and artistic social quarters make the LZ-129 a noteworthy stride in the air travel of the present. After the test flights this dirigible will begin active service as a running mate of the Graf Zeppelin between Europe and South America.

Cruising speed, that priceless quality that engineers are struggling to increase, is being squandered thoughtlessly in time leakage at station stops, with the result that performance is discredited and schedules unfulfilled. The accompanying article is based on one of the first serious attempts to make an exact study of the factors, other than cruising speed, that cause airline schedules to go astray.

Schedule Making

By Otto E. Kirchner

ONLY recently has it been realized that factors other than cruising speed play a very important part in the elapsed time between two air transport terminals and this time is the real product which air transportation has to offer to the traveling public. The dominance of the trend toward higher cruising speeds, now considerably in evidence, should not overshadow the importance of the other factors which are quite as necessary to the final schedule of the airplane. In building up a schedule for a particular airplane these are:

1 The time taken to taxi the airplane between the station ramp and point of take-off, and from the landing point to the station ramp

2 The time required for the pilot to run up and check the engine, or engines, just prior to take-off

3 The time taken to climb from take off, or glide to landing, in maneuvering to or from the course

4 The cruising speed of the airplane under recommended engine operating conditions

5 The average prevailing wind to be encountered on the course for the season in question

6 The flight distance between stations.

7 The time taken to handle the cargo and re-fuel the airplane.

The practice in the past has been to make rough estimates of time taken for these operations, since the elusive nature of some of them, especially considering wind allowance, led many to feel that no more reliable results could be obtained by an exact study. This policy led to continual adjustment of schedules with accompanying confusion on the line and an unpleasant effect on passengers who depended upon the regularity of the airways for business travel

Whenever possible time study was used in the investigation herein described to arrive at definite values for these factors In each case a large number of units produced results that can be assumed to be representative.

Ground taxiing

In the investigation of ground taxiing it was found by means of time study that airplanes taxi out to take-off at the rate of approximately 20 m p h but, when coming in from the landing point to the loading ramps, they travel at only 15 m.p.h. In spite of the slower speed, however, the time required to cover a definite distance is less when coming in than when going out to take-off. This may be explained by the fact that landing airplanes do not come to a full stop immediately but are in motion at the landing point and, because of the benefit of this initial start, cover the distance in less time In leaving the ramp, the airplane must first accelerate from a standstill after getting the go ahead from the dispatcher. Fig 1 is a plot of the relation of time to distance required to taxi from or to the loading ramp The type of airplane does not have any effect on the results obtained The averages lie along a straight line, indicating the accuracy which may be obtained by using the curve for future schedule formation

At the end of taxiing prior to take-off the universal practice is to check the operating condition of each engine. The time required for this operation usually is not appreciated Fig 2 shows the small difference in this time that exists between single motor and tri-motored aircraft The large portion of the time is required in preparation before run-up, by setting the brakes, etc, and after run-up, in turning the airplane around for the take-off, as the majority of airplanes tail into the wind in this operation

The actual time for take-off and maneuvering into position on the course is more than generally realized except in such cases where it is possible to take-off directly on course. In no case was this maneuvering found to be more than 240 deg, and the time required for this amount of maneuvering averaged 2½ minutes (Fig 3). In case of maneuvering for a landing it was found that in the majority of instances maneuvers were greater than 240 deg. This is due to the circling requirement of many airports and can result in loss of valuable time

In the future the time required for landing should be considerably reduced through close contact by airplane radio with the station tower controls now in operation in some of the larger cities

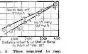


Fig. 1 Time required to taxi between station ramp and point of landing or take-off. The numbers in circles indicate the number of airplanes whose average performances was taken to determine the point on the curve.

Fig 2 Time required to run up engines prior to take-off

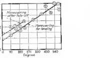


Fig 3 Time and number of degrees required in maneuvering to or from course

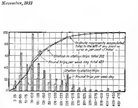


Fig 4 (above): Flight distances between scheduled stops and density of scheduled airplane movements between stations. Scheduled station-to-station flights grouped in 25-mile increments Vertical scale indicates number of trips

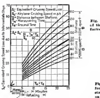


Fig. 5 (left) Effect of time loss on effective cruising speed.

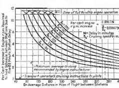


Fig 6 (right): Forcing the power plant to make up stop delays and retain schedule

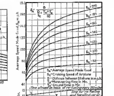


Fig. 7 (below): Effect of station-to-station flight length on cruising speed.

By means of the information sent out by the control tower observer, the pilot can glide into the field with the minimum amount of circling about the airport. The importance of a control tower observer, in his advantageous position for imparting information on field conditions and extent of airplane movements on the ground, to the pilot in flight about to make a landing, is not fully realized. It is surprising how few of the larger air passenger terminals utilize this method of control With a knowledge of the prevailing winds at the fields from which an operation is taking place it is now possible to determine the exact time allowance which should be made for taxiing out, run-up and take-off, or for landing and taxiing in In the formation of schedules, the special regulations of the fields involved must be investigated to determine deviations from normal procedure in flight maneuvers. The time of day must be considered, as on some airports special maneuvering conditions apply after sundown.

Station to station time

The prevailing wind between two stations in the United States may be determined from the Monthly Weather Review of the Department of Agriculture Selection of the most adverse wind or the average will depend on the policy of the operating company as to what percentage of schedules are to be completed on time A wind allowance nearer the average for a particular season of the year should be selected for a larger percentage of schedules made good. Changes in schedules more frequent than seasonal should be discouraged because of interference with schedules of connecting lines Knowing the prevailing wind and direction it is necessary to correct the airplane cruising speed. Graphical methods for determining this correction need not be discussed here as they may be found in any text on aerial navigation

An analysis of the distribution of stations based on flight distances led to very interesting results Only those stations were considered which had scheduled trips of at least one per weekday Fig 4 shows the number of small station-to-station flights. Those in the group from 76-100 miles in length represent a maximum and 80 per cent of all runs in this country are over distances of less than 200 miles The average for the country as a whole is a little better than two round trips per

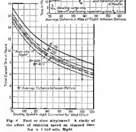


Fig 8 Fast or slow airplanes? A study of the effect of cruising speed on elapsed time for a 1,200 mile flight

day between each two stations on scheduled airways.

Cargo and fuel handling

The time required for handling cargo and refueling varies for different operators and airplanes, the average being about five minutes for handling cargo and ten or fifteen minutes for refueling Since speed made good is really the product sold to the air traveler it means nothing to him to talk of increasing cruising speed if time thus gained is lost in the stops.

A theoretical analysis was made to determine the effect of length of stop on the speed made good over any particular route The equivalent cruising speed lost in intermediate stops was determined first on the basis of stops every 200 miles and then for stops every 100 miles For airplanes with cruising speeds varying from 120 to 160 m p h maneuvering time was taken at five minutes An investigation of this curve, Fig 5, will show that, with stops averaging 200 miles apart, a difference of five minutes in ground time, for an air plane cruising at 120 m p h, will have the same effect as changing the effective cruising speed 5 miles per hour For the 160 m p h airplane under the same conditions, the change in effective cruising speed will be 7 m p h The effect is still greater with jumps which average 100 miles apart.

When considered in terms of effective cruising speed the time spent on the ground becomes a very important factor A 5-mile increase in effective cruising speed for no additional power output is certainly worth while. One method of bringing this about is by the design of airplanes that can be quickly unloaded and loaded with passengers, mail, and express without these items interfering with each other At refueling stations the length of stop depends on the time required to refuel The present method for refueling is crude and the time required greater than necessary This problem has not received sufficient thought. Perhaps we should study the overhead filling method used by railroads to fill water tenders This method is not flexible and would be unsightly at terminal stations The tower truck type of overhead trolley car repair device seems to offer possibilities An overhanging tower could be equipped with hose, funnels and direct control for fuel eliminating the use of ladders placed against the leading edges of the wings The tower platform could be made adjustable to any required height By efficient control one operator is holding his refueling down to ten minutes, a record so far.

Time loss and r.p.m.

With faster ships going into service there has been an impression that ground time is becoming less important because there is sufficient speed available to make up any time lost on the ground. Nothing could be further from the truth A theoretical investigation of the increase in per cent of revolutions per minute required to make up a loss of five minutes at a station, is shown in Fig 6 Some operators are now adopting the practice of running their motors approximately 50 r p m below the maximum allowed by the engine manufacturer This was assumed in the analysis It shows that an airplane normally cruising at 120 m p h would have to operate at full throttle to make up a five-minute-late start if the run was 100 miles By the use of the extra 50 r p m the airplane could only make up the five-minute loss in a minimum jump of 350 miles The higher the normal cruising speed of the airplane the less able it will be to make up lost time when operating under the conditions for which the schedules were made.

The importance of departure on time cannot be emphasized too greatly Unless full recognition is made of the factors entering into the make up of a schedule and proper allowance made for ground time, the airplane will not be able to hold schedules unless forced. This endangers the power plant. From past experience with complaints that airplanes are unable to produce the performance manufacturers have quoted, the author believes that, when faster ships become more common, a storm of protests will come in as insufficient allowance for time at stops will show up in terms of reduced speed.

If performance is to be measured on a basis of elapsed time, which is the only reasonable measure of speed, the air transportation industry will be confronted with the problem of studying the economy of making fast ships serve both the short and long jumps Since speed increase derived from additional power output involves increases in operation costs, it should bring returns to compensate for the added expense The use of higher powered airplanes on short jumps, however, results in low speed made good (Fig 7)

Fast or slow ships?

Fig 8 is a plot of the elapsed time to make a flight of 1,200 miles Curves are drawn for flights ranging from nonstop to stops varying from 100, 200, 300 and 400 miles, and for cruising speeds from 80 to 200 miles It shows that an airplane with a cruising speed of 160 m p h, with stops at 200-mile intervals has the same overall performance as one with cruising speed of 200 m p h. with stops at 100-mile intervals Speed increases from 160 m p h cruising to 200 m p h cruising will be obtained most likely at the expense of power

For economy in operation the author believes that there will be two general types of airplanes, the higher powered planes for long runs and the normal powered planes to act as feeders on the short runs, the latter making connections with the higher powered ships With 50 per cent of all runs equal to or less than 100 miles in length, there will still be a place for many normally powered aircraft, with highest aerodynamic refinement.

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Damping Elevator Vibration

HIGH SPEEDS that are developed by modern transport airplanes introduce many new problems to be solved by aeronautical engineers Among these is the problem of eliminating elevator flutter which is apt to occur with the conventionally constructed elevator at speeds in excess of 200 m.p.h. The heavier the elevator, the more tendency it has to flutter, it has been determined by Army engineers, who now recommend that metal surfaces be used as sparingly as possible on elevators, to keep down the weight

An effective means of dampening out possible vibrations of a wood elevator has been developed by engineers of the Lockheed Aircraft Corporation, Burbank, Cal, for the new Orion low-wing monoplanes built for American Airways Since vibrations are apt to increase rapidly in frequency and intensity at speeds in excess of 200 m p h, Lockheed engineers have given the subject of flutter considerable study, taking into consideration the 226-m p h top speed of the new Orion

Structurally, the Lockheed "vibration dampener," or counterbalance, consists of a 5-lb lead weight on the end of a curved arm which is attached to a special torque rib in each elevator The arm, a dural casting, is shaped so as to extend over and above the elevator hinge, and hold the weight directly in the center of a recess in the stabilizer when the elevator is in neutral position Only when the elevator is raised or lowered does the weight protrude below or above the stabilizer surface into the air stream

The entire counterbalance installation weighs a total of 6 lb for each side. It gives a 70 per cent static balance around the elevator hinge, reducing the moment of the elevator to 30 per cent No attempt is made to achieve a dynamic balance

The weight, having a different period of vibration than the elevator, in effect dampens out all noticeable vibrations of the elevator

Following up his comments on the results of a lack of standardization on basic types in the field of aircraft design, Mr. Huntington, in this, the second of a series of three articles, lays down a general specification for the ideal airplane for the private owner. In a concluding article to follow, his conception of a machine to meet the conditions he has imposed will be presented

Search for an Ideal

PART II

By Dwight Huntington

LOGICALLY, the first step in establishing an ideal type of airplane is to list those attributes most desirable for the particular purpose at hand Some items may be written down with a reasonable certainty that they will go unchallenged, but others will be controversial

For the present study a few primary assumptions have been made relative to the ideal plane. It will probably be the result of development rather than invention largely a skillful combining of tried and proven ideas The type selected must combine a pleasing symmetry of line with a ruggedness inspiring confidence Thoroughly workmanlike construction and finish are essential An amphibion is indicated because of the safety and utility inherent in that type, specifically a closed model, having openable windows, to permit of all altitude and all-season service To take advantage of automobile and motor-boat sales psychology seating and control arrangements should follow automotive practice. It should be a five passenger craft (between coupe and large sedan size) powered by one engine (either gasoline or diesel, self-starter equipped) driving a single air screw

I have chosen to group a number of desirable attributes under nine headings, sub grouping according to the major unit affected, whether body, power plant, undercarriage or wings (As the empennage is of minor importance it is included under the wing unit) Only those factors governing external design, which influence the form and placing of an essential unit, are here considered In each case below, the statement of the requirement is followed by a suggestion as to the solution (in italics) Many of the suggestions are conflicting, but, as always, the evolution of a satisfactory final design depends upon making the best use of compromises

I. Mechanical efficiency

A Hull. (1) Compactness and minimum weight, *hull type amphibion rather than fuselage-pontoon type,* (2) a comparatively small-sectioned hull aft of passenger compartment, (3) minimum number of doors consistent with safety and convenience.

B Power Plant (1) Cooling simplicity and reliability, *air cooling,* (2) ignition simplicity and reliability, *diesel engines,* (3) maximum power delivered to propeller, *direct drive,* (4) maximum drive simplicity and reliability, *direct drive,* (5) minimum drive weight *direct drive,* (6) most efficient speeds for engine and propeller *gear drive* (7) optimum propeller location permitting most efficient diameter for lower r.p.m, *remote drive,* (8) minimum engine support weight, *remote drive engine mounted low in hull,* (9) maximum simplicity and reliability of remote drive mechanism, *suggests engine and propeller mounted in close proximity to each other*

C Undercarriage. Sound and durable construction, *compact gear, oil-and-spring shock units, and a simple, positive-action retracting mechanism.*

D Wings (1) Most efficient distribution of area, *compactness of superposed planes;* (2) rigid and durable construction, *fewer and larger members*

II. Aerodynamic efficiency

A Body (1) Minimum frontal area, *hull type amphibion*

B Power Plant (1) Minimum resistance of cooling system, *liquid-cooled engine or more efficient air-cooling,* (2) minimum frontal area, *engine in hull, in longitudinal line with occupants, and remote drive,* (3) minimum slipstream resistance, *pusher propeller.*

C Undercarriage (1) Minimum resistance, *a compact gear, completely retractable into hull or other necessary surface*

D Wings (1) Maximum speed range, *monoplane surface tapered in plan form and airfoil section, having a minimum amount of external bracing and incorporating a variable lift device, along with a moderate wing loading*

III. Airworthiness, controlability

A Body (1) Balance and trim, *the placing of variable loads such as fuel, optional passengers and all baggage, in close proximity to the C G,* (2) maximum controlability by concentration of weights along the three axes of control, *hull type amphibion*

B Wings (1) Ability to effect step-angle mush landings under full control, *non-spin characteristics pronounced lateral and longitudinal dihedrals, generously-sized control surfaces,* (2) inherent stability, *lateral and longitudinal dihedrals or equivalent*

IV. Seaworthiness

A Body (1) Maximum flotation with minimum air resistance and structural weight, *hull type amphibion, long*

hull instead of short hull and outriggers, (2) navigability in sea, *a high cruiser bow,* (3) rapid takeoff, *wide planing surface and adequate steps,* (4) ease in marining, *pronounced Vee bottom,* (5) maximum pitch and roll stability, *hull type amphibion with its C G low in relation to C B ,* (6) maneuverability, *water rudder operable with air rudder*

B Powerplant (1) Roll stability, *engine low in hull, remote drive,* (2) propeller well above waterline, *remote drive,* (3) safety and convenience in mooring, with propeller idling for purposes of control, *pusher propeller, high bow, unobstructed fore-deck*

C. Undercarriage (1) Navigability, *wheels retracted well out of water.*

D Wings. (1) Rolling, *high wing monoplane, wings high above waterline,* (2) pitching, *empennage surface high above waterline*

V. Landworthiness

A Powerplant (1) Stability, *engine low in hull, remote drive,* (2) propeller safety in taxiing, *pusher propeller.*

B Undercarriage (1) Mush landings *a sturdy, compact gear with relatively long travel oil shock units,* (2) decreased landing runs *an all-wheel undercarriage, all wheels bearing at all times, affording maximum braking surface* (3) decreased tendency to nose-over, a *compact undercarriage bringing C G of ship close to ground also a long wheelbase with one or more wheels located well forward of C.G ,* (4) adequate lateral stability, *low C G and wide tread of main wheels,* (5) maximum maneuverability, a *steerable, all-wheel undercarriage, with principal load-carrying wheels approximately aligned laterally with C G* , (6) beaching efficiency, *large diameter wheels and wide tires, affording maximum bearing area* (7) winter and muddy field serviceableness *ability to vary the vertical retraction of main side wheels to maintain lateral balance while using hull keel on ice or hull bottom on snow or mud*

C Wings (1) Ability of ship to travel highways, towed or under own power, *a folding wing arrangement, preferably one permitting propeller to swing, and rendering access to the propeller disk by careless persons a difficult procedure,* (2) decreased housing space, a *folding wing arrangement,* (3) decreased wind-storm hazards when ship is parked, *a folding wing arrangement*

VI. Comfort and convenience

A Body. (1) Ease of ingress and egress, *large, unobstructed doors, placed in line with the seats they serve or the seats most used,* (2) adequate door height, with sills well above waterline to prevent breakage, *a top deck hatch automatically operable in conjunction with shallow doors,* (3) ample seat, head and elbow room, *suggests a large frontal area of hull and elimination of external engine nacelle,* (4) a luggage compartment of adequate capacity, easily accessible to occupants from within cabin, while afloat ashore and aloft, a *compartment immediately aft of rear seat as access to a compartment in bow may interfere with control*

B Powerplant (1) Decreased nervous strain, by noise reduction, *an engine silencer exhausting aft or, preferably, abaft of, occupants, also a gear-driven slower speed propeller,* (2) elimination of engine fumes, *engine be located abaft of occupants,* (3) engine should be housed, yet in a position facilitating inspection, cleaning, and minor adjustment and repair by occupants from within ship, while afloat, ashore and aloft, *engine mounted low in hull, aft of occupants; remote drive;* (4) reduced propeller dangers to pedestrians due to its exposed position, a *pusher propeller located amidships since people usually take shorter distances—around nose—in walking from one side of a plane to the other.*

C Undercarriage (1) Ease of ingress and egress, *a compact undercarriage placing hull close to ground,* (2) plane should sit approximately level on ground, *calls for a radical redesign of present-day undercarriage,* (3) wheels should not be in line of ingress to ship, *correct relationship between doors and undercarriage*

D Wings (1) Decrease conditions causing airsickness and tendencies to pitch, roll, pound and drop excessively, *lateral and longitudinal dihedrals or equivalent in conjunction with wing shock absorbers,* (2) obviate the necessity of rigging, *a rigidly braced structure with absence of small-sectional wires,* (3) *minimum amount of inspection and overhaul, fewer and larger members with vital parts in positions facilitating inspection.*

VII. Visibility

A Body (1) Pilot and passengers should have fullest possible ranges of direct vision in fore hemisphere, *occupants in bow, pilot ahead, his vision in fore hemisphere obstructed only by hull, chine lines of fore-deck designed to facilitate vision ahead and downward windshield and window large well placed and virtually unobstructed* (2) pilot and passengers should have excellent direct vision, and the former indirect vision by means of mirrors in the aft hemisphere, *a passenger compartment cut sharply away in rear to a vertical knife edge equipped with large side and deck windows—also a small-sectioned, low, unobstructing hull aft*

B Powerplant (1) Engine should not interfere with pilot's vision, *engine low in hull, remote drive,* (2) occupants should not be compelled to peer through the propeller disk, *pusher propeller*

C Undercarriage (1) Should not interfere with pilot's vision in lower fore quarter-spherical wedge, *gear with main wheels aft near C G and a forward support under hull*

D Wings (1) Should not interfere with pilot's vision in fore hemisphere, pilot ahead of wings; (2) should blanket smallest possible angle in aft hemisphere, *thin wing parasol monoplane wing mounted in line with rear vision mirror or pilot's eyes, and incorporating pronounced sweep-back and dihedral, also minimum amount of external bracing located as far as possible from pilot's eyes,* (3) wing should not blanket pilot's vision aft when banked in a turn, *gull construction of wing roots at hull and windows in upper deck or windows in center-section of parasol, or low-wing or mid-wing monoplane*

VIII. Fire hazard

A Powerplant (1) Ignition and fuel risk, *diesel engine,* (2) flight risk, *engine aft of occupants within hull, in position for easy clearing and inspection, also remote drive,* (3) gasoline tank risk, *crash-proof tanks located outside of hull,* (4) exhaust risk, *exhaust vents abaft of passenger compartment, with no vulnerable part of ship nearby*

IX. Crash hazard

A Body (1) Protection of occupants, *a very rigid keel and frame construction,* (2) rapid egress, *large operable windows and deck hatches,* (3) elimination of poised weights, *locating heavy baggage, battery and other weighty objects low in hull*

B Powerplant (1) Avoid dangerously poised weights, *engine located low in hull, remote drive fuel and oil tanks low in hull*

C Undercarriage (1) Avoid dangerously poised struts, *struts located as far as possible from occupants and designed to thrust away from seats*

D Wings (1) Avoid dangerous poised structural members, parasol monoplane, wing abaft of occupants, with spars and struts designed to thrust away from seats

I am well aware of the ease with which advocates of pontoon types, biplanes, tractor propellers and such like may discern flaws of partiality in the foregoing sketchy analysis. The present object so far, however, has been to suggest a design method rather than to select one best design. In the concluding article of this series we shall be more specific, get down to an actual case, and apply the above specifications to a design which may embody some suggestions for the future

E D I T O R I A L S

AVIATION

EDWARD P WARNER, *Editor*

On Guard!

THIS is to be an editorial that we have often been urged to write during the past five years We have always refused to do it We have held back and held back, so long as there seemed the slightest reason for doubt or for difference of opinion Now that the affairs of the world have reached a point where doubt and difference of opinion can hardly any longer exist, we hope that our deliberation will add force to the expression that we are at last ready to make.

It has been our invariable rule to refrain from any direct argument for enlarged military forces We have felt that the scope of the nation's preparation for possible warfare had to be fixed by considerations of high national policy, and that it was improper that any one having the interest of any industry primarily at heart should attempt to intervene in the decision We hope that our determined abstention will be remembered, both within the industry and by our friends outside its ranks to whom we are addressing this editorial, when we say that the time has come when we can be silent no longer

FOR a dozen years groups of statesmen have been engaged in attempts to develop machinery to fend off the danger of war Their efforts have deserved and still deserve the active sympathy of the world, but the machine that they have painstakingly constructed seems to be falling into ruins The conference that was to find means of limiting the cost of armaments and of preventing armament competition seems to have run its course After a year and a half of life it is threatened with total collapse. The attempt to organize the world for the preservation of peace has broken down in the Far East, and it is threatened with a test still more critical in Europe. Efforts to preserve peace will continue, and they will still deserve the widest possible support, but in the meantime we have reached a point where we must consider our own safety in a world of tooth and claw

For us, patience has ceased to be a virtue We ought to set about equipping ourselves for self-protection We ought to do it without delay, and when our plans have once been made we ought to let nothing stop us short of their complete execution unless the praiseworthy attempts to reduce the possibility of war and reduce the necessity of armaments by international action shall actually achieve successes of which they have so far given but little promise

THE total expenditures of our government upon military and naval aeronautics, including the indirect as well as the direct outlay, have been running about $100,000,000 a year With all due regard to the present financial position and to the urgency of governmental economy, it seems to us that the present world position requires that that figure should be doubled The enlarged sum should be expended with the utmost care, but at the same time with the greatest possible diligence, so that the toal effective strength of our air forces should be increased by at least 40 per cent over the next two years and doubled over the next four To secure the necessary personnel we should substantially enlarge upon the present practice of allowing prolonged terms of active duty to reserve officers To secure the necessary material at the lowest possible total cost and to maintain our industrial plant in the best possible condition to meet emergency demands, the government should frankly accept the manufacturers of military aircraft as partners in an enterprise of national importance and allocate the business on such terms that plants will be kept running steadily and organizations held together The feast-or-famine policies of the past have given manufacturers a succession of more or less irregularly spaced orders with gaps of virtual inactivity between In the face of this very real need of preparing for national protection, compensation for the work done should be upon a basis which will take account not only of the actual current rate of turnover of labor and material, but also of the capital invested and of the value of the plant and the organization as a permanently maintained part of the nation's potential industrial strength with a direct military application To maintain readiness to contribute to the protection of the national interest in time of danger is to perform a public service The procurement of military airplanes is not an ordinary matter of buying the most satisfactory manufactured product at the lowest possible price It is rather of the order of a public utility, and it must be so regarded by the government.

Some of these recommendations may sound very startling They have not been arrived at without a

great deal of deliberation We are now engaged in a national program of spending more than $3,000,000,000 upon public works The plan is an admirable one, but if the world bursts into flames and we have no fire extinguisher ready to our hand to protect our own homes we shall gain but little advantage from new bridges and dams and tunnels and hospitals As the political scene appears at the moment when this editorial is written, it would be no more than a reasonable precaution to allot 10 per cent of the public works money to the enlargement of military and naval expenditures over the next two years, and to give to the development of our military air power a half of the total sum so set aside If war breaks out either in the Far East or in Europe particularly the latter, it will be pre-eminently an air war In planning for our own protection we shall have to lay pre-eminent stress upon aviation

Let us say again, at the risk of becoming monotonous and lest we be accused of selfish motives, that we do not make this proposal in the interest of the aircraft industry, but in that of the people of the United States and of a large part of the rest of the world. If we were selfishly concerned with the prosperity of the industry, there have been plenty of times in the past when the industry needed increased support by government purchasing power as much as it does now We have made no such appeal on those occasions We make it now because conditions seem to require it We shall be glad to withdraw it when—but not until—we see the governments of the world as a whole set upon courses that make an early use of military aircraft on a grand scale improbable For the moment, that specification is by no means met.

With Faint Praise

THE editorial writers of newspapers need all sorts of information on all sorts of subjects, but they frequently exhibit a lamentable ignorance in matters pertaining to modern air transportation Undoubtedly believing that they are helping it along by giving it space in their columns, unfortunately they often succeed in doing more harm than good

For example, a recent editorial in that most distinguished of dailies, the New York *Times*, a generous supporter of aeronautical initiative, calls attention to the fact that one of the airlines is experimenting with the idea of installing berths in transport planes for the convenience of night travelers So far, so good The idea, although far from new, certainly rates further study and sympathetic attention BUT then the writer goes on with a hypothetical study of the sensations of the night flying traveler "Could he lose himself in several hours of recuperative sleep? The noise of the propellers can be heard half a mile away in a bedroom on terra firma! Planes cannot always be kept on an even keel, and there are such things as air pockets [—this in 1933!] Suppose the pilot should go to sleep at the controls! . . . Air-minded (people) even when flying in the cockpit have had no difficulty in dropping into a dreamless sleep despite the propeller's roar "

But the writer did not wish to be unconstructive Having conjured up the ailment, he provides an antidote He recommends to the timid soul a study of the accident curves, and winds up with the comforting suggestion that "anyway, an insurance policy can be taken out for the family"

NOW if such an editorial had appeared under a 1928 date line there might have been little cause for astonishment Palpably the writer is blissfully dwelling in air transport's prehistoric past Obviously he has never been introduced to the elusive decibel, nor been told that the level of sound intensity in the cabin of a modern transport airplane is below that of the average pullman car Obviously he has never had the opportunity of comparing the riding qualities of the airplane with the unholy shaking-up by switching engines to which the veteran sleeping car passenger has become hardened Why pilots should go to sleep on the job any more than railway engineers or bus drivers is also a mystery It must have escaped the notice of the critic that some hundreds of passengers are even now traveling by air during every night, and that they would be quite as safe, and even more comfortable in berths than in the reclining chairs in which they now peacefully doze away the miles.

The point of it all is this—uninformed writers are passing on to the public, as facts, erroneous ideas about dangers that exist only in their own imaginations We of the aircraft industry tell each other how safe and how comfortable it is to fly about in our airplanes, while, in spite of the efforts of public relations experts, the most grotesque misinformation slips out to potential customers All such writers should be "taken for a ride"—in a modern transport airplane.

Public Works and Aviation

IT IS more than two years since we first used these pages to advocate airport development as a particularly effective form of public unemployment relief Under the conditions that then existed, most of the people who had the power to promote or to retard such a plan thought it impracticable to do anything In a few states new airports were built and old ones were improved through the services of men unemployed and upon the relief rolls Over most of the country's extent, however, nothing was done

But that was two years ago, and evidently we were before our time. Now conditions have changed. Now it can no longer be argued that the difficulties in the way of promoting airport work in a depression are insuperable The difficulties have been swept aside by

act of Congress The Public Works Administration has been created, and $3,300,000,000 have been appropriated, for the express purpose of carrying on with projects of which municipal airport development is almost a perfect type

In our first editorial attack on the subject we suggested, and we must admit that we did not feel particularly sanguine about the realization of our dream, that local airport work should be backed by central government on a descending scale, so that a certain contribution might be made by state governments and another contribution, for a small part of the necessary total, might come from Washington At that time there was no law to permit of anything of the sort, at least so far as Washington was concerned Now a new law has been created, and direct federal grants for the support of local public works are being made in exactly the form that we had hoped for

If a municipality wants to build a new airport or to improve an old one, or if a state seeks to carry out a project for a network of auxiliary fields, Washington is at last in a position to extend a helping hand It is only necessary to secure the approval of the Public Works Administration That given, 30 per cent of the total cost of the work can be paid outright from the federal treasury, and the 70 per cent that remains can be borrowed from the same source on easy terms. The spending of the money so borrowed will save the municipality the immediate necessity of spending for relief of the unemployed and destitute, out of its current revenues, a sum that might well be very nearly as large The immediate financial burden on the local community is lightened, and the facilities for the use of aircraft are improved, with the city or state completely relieved of one-third of the cost and given a substantial number of years to pay off the remainder

NEEDLESS to say, the Public Works Administration does not hand out large sums of money to everybody that comes along and asks for them It is necessary to prove the real usefulness of the work proposed, its ultimate value to the community and its value in providing employment Those who are actively engaged in aviation have no doubt of the importance of adequate airport facilities for every community, and no trouble in furnishing evidence to support their case Unfortunately the officials of the Public Works Administration have not been actively concerned with aviation and they want to be shown Nothing will be more useful in the showing process than the simple submission of a large number of widely scattered airport and landing field projects by many different towns and cities and states, each proposal backed by a recital of the local situation and of the reasons why that particular community feels that it needs that particular work.

Apart from the need for improved airport facilities in many areas and, turning for a moment to the second point of social usefulness in the present emergency, it is still true as it was in 1931 that airport and landing-field work has special advantages The preliminary engineering and planning are simple The actual employment of labor can begin almost immediately. The proportion of the total cost that goes directly to labor locally employed is large A substantial amount of unskilled labor is needed All those are points that PWA watches closely, and to which local governments anxious to produce relief in the most efficient fashion possible and to couple it with direct employment ought also to give the most careful consideration

Unfortunately all this doesn't seem to have taken effect to any great extent as yet. Deplorably few applications for public works funds for airport work have been received, and some that have been received have been deplorably crude in their presentation This is a point on which every one of us can set to work to persuade the officials of *his* city and *his* state to look into their aeronautical problems and to see whether it isn't true that they need something in the way of new or additional ground facilities and that now is the best time to get them The greater the number of intelligently-prepared applications that come to Washington, the more careful the consideration that is likely to be given to aeronautical public works projects as a class At least 250 well supported applications ought to be filed within the next 90 days, but they won't be unless those of us who have aeronautical interests and know something about the technicalities of the field make it our business to appeal to the officials of our own communities, to show them what their own neighborhoods need, and to persuade them that they should go after it.

Hail and Farewell

ELSEWHERE in this issue are recorded something of the activities of Admiral Richard E. Byrd and his associates in preparing for the second Antarctic Exposition, and we hope, as news trickles northward from Little America, to keep our readers in touch with aeronautical affairs in the Far South Flying activities will assume an even more important place in this exposition than in the last The Admiral will draw heavily upon aircraft Aviation will draw upon the Admiral, on his return, for a wealth of new information on what can be done in the air, and how it can best be done under difficult conditions Of special interest will be the work done with the autogiro taken along as an auxiliary to the Curtiss Condor transport Reports on the condition of the Ford airplane abandoned on the ice three years ago and now to be reclaimed, will throw a revealing light on the weather-resistant qualities of a duralumin structure under severe exposure conditions

In the meantime, our best wishes go to the Admiral and his crew It is no light matter to look forward to a year and a half in the Antarctic, but it is confidently expected that the results will repay the effort

NEWS OF THE MONTH

Public Works Fund

THE TOTAL allotment (to Oct 25) to aviation by the Public Works Administration was $17,207,486 under the new law which provides that the government supply 30 per cent of the cost of labor and materials, plus a 4 per cent loan if desired, to certain approved projects In addition to the regular appropriations, $15,000,000 will be divided equally between the Army and Navy for new airplanes Other allotments to federal agencies include $452,700 to the Aeronautics Branch of the Commerce Department, $247,944 for the National Advisory Committee for Aeronautics, $17,000 to the Navy Bureau of Yards and Docks for the marine flying field at Hampton Roads, $1,383,442 to the Army Air Corps for airport construction.

Newark Airport is using its $22,000 federal grant to enlarge the flying field by 45 acres, build a new runway, and install new water pumps to supplement the present drainage system, a new radio transmitting and receiving set to control air traffic on and in the vicinity of the field will be installed and the floodlighting system will be modernized A grant of $4,400 to Columbus, Ohio, will be used for improvement of docking facilities (see page 343), shelter house and pavilion at the airport San Francisco Municipal Airport allotment of $53,000 will aid in building an additional macadam runway on hydraulic fill on tide land with drainage and lighting systems The state of Washington has received a grant of $27,000 to aid in the construction of a military plane hangar, costing $112,000 at Felts Field, Parkwater, for the 41st Aviation Division of the State National Guard Aeronautics Branch Department of Commerce will use an allotment of $19,500 for the installation of airway lighting between Louisville, Ky., and Indianapolis, Ind. Largest airport project yet proposed is that planned by the South Park Board, Chicago which involves creating an island in Lake Michigan for the site

Pilots' pittance

Six hundred and fifty pilots of the nation's leading airlines, threatened to strike rather than accept a new wage scale scheduled to take effect Oct 1 They feared pay cuts of from 30 to 40 per cent but operators declared that the general average income for pilots would go up Urging that the dispute be "ironed out around the table" Chairman Robert F Wagner of the National Labor Board, hastily organized a hearing before the board at Washington on Oct 4, at which airline officials and representatives of the Air Pilots Union agreed to appoint a fact-finding committee of one representative appointed by the airlines, one by the pilots, and the impartial chairman, Bernard L. Shientag, of the New York Supreme Court, appointed by the board The committee will submit its findings within three weeks The board's decision as to wages (retroactive to Oct. 1) will be accepted as final.

His case tied up with the dispute between the pilots and the airlines, Pilot Wayne Williams, dismissed by Transcontinental and Western Air, was ordered to be reinstated by a ruling banded down by the board on Oct. 5

Vidal's new set-up

Reorganization of the Aeronautics branch, Department of Commerce, continues under the directorship of Eugene L. Vidal The Air Regulation division, which includes Airline Inspection Service, General Inspection Service, and Manufacturing Inspection Service, is in charge of Major J Carroll Cone, assistant director Chief of the Airline Inspection Service is Major Rudolph W Schroeder, pioneer flyer and aviation engineer, formerly president of Sky Harbor Airport, Chicago George E Gardner, for several years connected with the Aeronautics branch inspection service, is head of the General Inspection division Manufacturing Inspection is in charge of John H Geisse, formerly with the Naval Aircraft Factory and the Comet Engine Company. In the Air Navigation division are Airway Maintenance including the six airways maintenance districts into which the United States is divided and Airway Development which comprises Engineering and Construction Communications Services, Radio Equipment and Research and Airways Mapping The Air Survey Section will be directly under the office of the assistant director in charge of Air Navigation, Rex Martin Named as special assistant to Mr. Vidal, temporarily, is L H Harris, formerly chief of airline maintenance inspection Richard S Boutelle, of Nashville Tenn., has been appointed Aeronautics Development Expert

No written examination will be required of a pilot who applies for renewal of his license more than six months after the time of its expiration, according to the new amendment to the Air Commerce Regulations As formerly, the pilot will be required to pass a physical examination and a flight test. The new amendment does not in any way affect the requirement that a written examination be accomplished by an applicant for original license

N.A.A. Elections

At the annual convention of the National Aeronautic Association Hiram Bingham, former Senator from Connecticut, was re-elected president while F. Trubee Davison, president of the American Museum of Natural History and former Assistant Secretary of War, was chosen vice-president, replacing Rear Admiral Richard E Byrd John F Victory was re-elected treasurer and Robert F. Garland of Oklahoma, secretary The governors at large are Orville Wright, Godfrey L. Cabot, Porter Adams, William B. MacCracken and Frank M Hitchcock, former Postmaster General, who started the air mail service. Edward P Warner, editor of AVIATION, was elected governor for New York state, replacing Charles L Lawrence, retired A resolution was adopted changing the method of selecting state governors, who after January 1st will be elected by ballot by the state organizations instead of by delegates at the annual conventions

Air service extensions

Boston to Miami in a day's flight with Pan American connections for the West Indies, Central, and South America, is the result of a new permanent service of Eastern Air Transport linking New York and Miami and connecting at Newark with American Airways' Boston plane Curtiss-Wright Condors fly the new schedule of 1,210 airway miles in twelve hours Co operation of American Airways with the Kohler

Calendar

Nov. 11	Armistice night aviation dinner and show Hotel Ambassador New York
December	International Rally Cairo Egypt.
Dec. 14	Meeting of the Federation Aéronautique Internationale, Cairo, Egypt.
February	Viceroy's Challenge Trophy 700-mile Race Delhi India
Feb 9-13	Races — Dedication Shushan Airport New Orleans La.
May 27	Deutsch de la Meurthe Cup Race

Aviation Corporation has brought Milwaukee within eight hours of New York, and Chicago and Washington, D. C., are now directly linked by a new schedule of American Airways using Ford planes and flying via Indianapolis, Cincinnati, and Charleston, W. Va. Ferry service across Chesapeake Bay from Easton, Md, to Baltimore in Stinson, Jr., planes cuts the time formerly required to make the trip by ferry-boat and trolley from 3½ hours to one hour ten minutes

Pan American Airways has made an agreement with the United Fruit Company for the interchange of passengers and express and made similar arrangements with the Roosevelt-International Mercantile Company and Colombian Steamship Lines In Germany, two fast freight trains, running between the Reich and East Prussia, have been discontinued by the Railway Administration and replaced with multi-engined freight planes by contract between the railway and the Deutsche Lufthansa

NEW HEIGHTS

Although the record may not be homologated by the Federation Aeronautique Internationale because Soviet Russia is not a member, the Stratostate U S S R reached a height of 62,300 ft, an altitude never before attained by any type of aircraft.

Increased express traffic

One hundred and ninety-five per cent more aerial freight was carried by the Railway Express Agency for the nine months of 1933 ending Sept 30 than for the corresponding period of 1932, while the traffic for September increased 108.2 per cent over that for the same month last year. Total mileage of the system has been increased to 13,235 miles by the addition of the 367-mile Hanford's Tri-State Air Lines between Omaha, Minneapolis and St Paul

Records abroad

The world speed record for a 100 km (62 mile) course was smashed at Ancona, Italy, on Oct 8 by Lieutenant-Colonel Cassinelli at 393 33 m p h His Macchi seaplane, equipped with a 2,400 hp Fiat engine, was similar to Lieutenant Francesco Agello's Red Bullet (AVIATION, June, 1933) Although Cassinelli's record has not yet been approved, it exceeds that of Flight Lieutenant J N Boothman of the British Royal Air Force who piloted a seaplane over a 100 km. course at 342 8 m p h at Spithead in 1931

The third attempt within a month of the French aviator Gustave Lemoine to establish a new altitude record was successful on Sept 28 when he attained a height of 44 822 ft The former altitude record (43,976 ft.) was held by Capt Cyril Frank Uwins of England. Lemoine went up from Villacoublay, near Paris. He was piloting a Potez 50 plane with a Gnome-Rhone Mistral Major fourteen-cylinder radial engine.

After eight successive failures to get off the ground, the Soviet stratosphere balloon "Stratostat U S S.R." succeeded on Sept. 30 in rising to a height of 62,300 ft. (11 8 miles), thereby shattering Piccard's record of 53 200 ft. (10 1 miles) Since the Soviet Union is not affiliated with the Federation Aéronautique Internationale, however, it is possible that the record will not receive official recognition Built by Red Army engineers exclusively out of Soviet materials for purposes of scientific observation, the balloon is the world's largest (gas capacity 88,375 ft) The crew consisted of Pilot George Prokofiev, Assistant Pilot Ernst K Birnbaum, and Engineer Constantin Godoonov

A military fighter airplane C R 30 with a Fiat A 30 engine of 650 hp piloted by Flight Captain Baldi and Flight Lieutenant Buffa of the Italian air force, competing for the Bibesco Trophy, averaged 189 9 m p h over the 1,150 km (713 mile) course from Rome to Bucharest Established in 1931 by the Roumanian Prince Bibesco, president of the Féderation Aéronautique Internationale, the race is flown over the route Rome-Bucharest by Italian or Roumanian military pilots with any type two-passenger military plane The trophy will be permanently awarded to the pilot who reaches the highest speed at the end of three years

England to Australia in six days eighteen hours is the new mark set by Flight Lieutenant Charles T P Ulm accompanied by Assistant Pilots G U Allen and P G Taylor and John Edwards, navigator, in an Avro 10 plane equipped with three Wright-Whirlwind motors Ulm clipped ten hours 54 minutes from the ten-day old seven day 30 hour 50 minute record of Wing Commander Sir Charles Kingsford-Smith, who, fighting against nervousness and ill-health flew his low-winged Percival Gull monoplane to break the 1932 record held by C. W A Scott.

Fastest

Sustaining its record making performance at Chicago, Wedell's racing plane flew from East Hartford, Conn, to Roosevelt Field, L. I (100 miles) in eighteen minutes on Oct. 13, and established a new New York-Cincinnati record three days later by covering the 615 miles in two hours, 40 minutes

For breaking both the East-West and the West-East transcontinental speed records (AVIATION, October, 1933) Roscoe Turner of Los Angeles received the Harmon Trophy, awarded annually through the American chapter, Ligue Internationale des Aviateurs

Do air shows pay?

Disconcerting conclusion to the National Charity Air Pageant held at Roosevelt Field, L I, on Oct. 7 and 8 was the bankruptcy petition filed by National Air Pageant, Inc, announcing a deficit of $40,365

Featured events included the amateur pilots' competition in which Mrs Cecil W Kenyon of Waban Mass, and Felix William Zelcer, of New York, won prizes of $5 000 each The first record in the recently established amphibion category was made by Major Alexander de Seversky in his self designed Whirlwind-powered SV-I His average speed was 180 3 m p h Jimmy Wedell's attempt to better his own world speed record for land planes almost ended disastrously when the racing cowling of his Wasp-motored Wedell Williams monoplane jarred loose. The Kate

Smith Trophy race for women was won by Edna Marvel Gardner in a Waco. Thrilling to the crowd were clever acrobatic feats performed by Captain Al Williams and Major Ernst Udet, and formation flight maneuvers by military planes from Langley and Quantico.

Curtain-raisers to the pageant were the transcontinental night derby over the beacon-lighted TWA route, won by Montgomery J Chumbley of New York, and the aerial treasure hunt, sponsored by Bernarr McFadden, publisher of *Liberty* magazine, winner, Pete Sones of Haines City, Fla, flying a Stinson

National buys into Pan American

The majority of the assets of the Aviation Securities Corporation of New England, including 9,300 shares of Pan American Airways and 36,500 shares of Curtiss-Wright Corporation "A" stock, has been acquired by National Aviation Corporation, bringing its total net tangible assets up to approximately $7,000,000 with holdings in Pan American, Western Air Express, United Aircraft and Transport Corporation, Curtiss-Wright Corporation and Douglas Aircraft Company, Inc. National Aviation owns the capital stock of National Air Lines With the additional Pan American stock acquired from the New England Company, National Aviation ranks among the largest known stockholders in Pan American Airways with a total of approximately 75,000 shares The Cord interests owned some 64 500 shares of Pan American a year ago and their holdings have been reported increased to between 80,000 and 100,000 shares

The Condor tries its floats

At New York's North Beach airport, Harold I. June, chief pilot of Byrd's second Antarctic expedition, conducted successful tests of the Curtiss-Condor seaplane with floating-gear, in which Admiral Byrd plans to fly over the South Pole for the second time Loaded to maximum capacity (gross weight 17,800 lb) with the Smith controllable pitch propellers set for best take-off conditions the plane left the water in eighteen seconds Top-speed with a full load was 149.7 m p h With 17,000 lb gross weight the rate of climb was 730 ft per minute With the same load the plane showed ability to climb slightly on one engine near sea level The proper gross weight for the ship on floats was determined to be 17,800 lb (weight empty 11,155 lb, useful load 6 645 lb.)

Flights across the sea

As rapid follow-up to their impressive non-stop formation-flight of 2,059 miles from Hampton Roads Va, to Coco Solo, Canal Zone six of our naval patrol flying boats made a one-stop formation flight from Coco Solo to Acapulco, Mexico, thence to San Diego, Cal Flying time from Coco Solo to Acapulco (distance 1,250 miles) was fourteen hours. Leaving one slightly-disabled plane at Acapulco, the squadron flew the 1,648 miles of the second leg of the course in eighteen hours, 21 minutes With slight increase in the supercharging of their engines the same planes are expected to make a non-stop flight to Honolulu, using the dirigible Macon as a liaison ship The Macon arrived at her permanent home at Sunnyvale, Cal., on Oct. 15, after a 2,600 mile trip from Lakehurst, N J

Tragedy

Russian aviation sustained an irreparable loss when a plane flying blind through stormy weather struck a tree and crashed near Podolsk killing P Baranoff, vice-commissar of heavy industry and director of the Soviet aircraft industry Also killed were three other important aviation officials, A. Goldman, chief of civil aviation, V Zarzar, air representative of the state planning commission, C. Goobonof, factory manager in Moscow Mme. Baranoff A Petroff, the pilot and mechanic were other victims

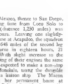
Baranoff will be replaced by George N Coroley, formerly director of one of the large aircraft engine factories Petroff was well known in this country, where he was actively connected for about two years with the Amtorg Trading Corporation

A veteran returns

Bound for the Century of Progress Exposition at Chicago came the mighty Graf Zeppelin which, five years ago, made the United States the objective of her maiden voyage. In addition to regular stops to deliver mail and freight at Pernambuco and Rio de Janeiro in Brazil, the Graf's flying schedule included calls at Miami, Fla, and Akron, Ohio, before the arrival at Chicago For those who would avail themselves of the most modern of transatlantic crossings, passage for the return trip from Akron to Friedrichshafen by way of Spain has been advertised at the rate of $600 to Seville or $650 to Friedrichshafen Auspicious preliminary to the Graf's taking off for America was her new record of 71 hours for the flight between Pernambuco and Friedrichshafen, the mail delivery record from Rio de Janeiro to Berlin was lowered by nearly seven hours largely because of the increased efficiency of the auxiliary mail planes In 300 flights covering a distance of 428 766 miles the Zeppelin has carried 17 500 passengers 44 092 lb of mail and 81,570 lb of freight

Twin twin Wasps for transport

A Boeing 247-A owned by United Aircraft and Transport Corporation is to be equipped with two-row Wasp Junior engines for executive use. The twin Wasp engine has a rating of 650 hp at 2,400 r p m at an altitude of 7,000 ft, with an overall diameter of 43¾ in. (AVIATION, April, 1933, p 129)



Charles E. Thompson

THE ashes of Charles E. Thompson, 63, famous automotive inventor, who died on Oct. 4 in Washington, D. C, were scattered over the city of Cleveland, scene of his industrial career, by Major James Doolittle, 1932 winner of the Trophy classic, sponsored by Mr Thompson.

Founder and president of Thompson Products, Inc, he was the first to introduce the all-steel valve, and later alloy steel valves, since used extensively in the airplane industry; he also promoted the use of hollow stemmed salt-cooled valves.

First president of the Glenn L. Martin Company which he helped to establish, he was likewise one of the organizers of Trans-American Airlines (now a part of American Airways) and the Thompson Aeronautical Corporation He was twice president of the Motor and Accessory Manufacturers Association and was a director of the recently established Automotive Parts and Equipment Association which will administer the NRA code

Westchester demands rights

Answering a petition from the Westchester Air Pilots' Association, signed by more than 5,000 residents of the county, for a municipal airport, the Westchester Board of Supervisors authorized an engineering survey of the cost of building an airport on property already owned by the county

Lindbergh reports

No final opinion as to the practicability of the proposed Greenland route transatlantic crossing which he has been investigating for Pan American Airways could be offered until the route had been flown in winter, Colonel Lindbergh told British air experts in London The flying boats, now being built for Pan American, with a 2,500-mile range, capable of hopping from Newfoundland to Ireland without refueling are the best solution at present, he said

High altitude sleeper

One of the first flying sleepers in the world flew into Newark airport from Atlanta, Ga, on Oct. 6, carrying Captain Edward V Rickenbacker, director of public relations for North American Aviation, Inc, and Alexander Strong, Boston engineer, as occupants of its two berths. Should demand arise, Eastern Air Transport is ready to convert several Condors from 18-passenger day transports to sleepers with eight berths and five chairs A similar experiment was made recently by American Airways over its southern trans continental line.

The soaring fraternity

Over the Blue Ridge Mountains of Virginia soared Richard C du Pont on Sept 21 in his Bowlus sailplane for 121 6 miles, a distance nearly equal to the international gliding record of 136 8 miles (made by Gunter Groenhoff in 1931) and surpassing by 66 miles Jack O'Meara's record

Now that the SSA has been admitted to the ISTUS, international soaring organization, O'Meara can receive the highest soaring pilot license "D" for which he qualified in the 1932 contest at Elmira, N Y, as did Martin Schempp The looping record for gliders, 68 consecutive loops, was made at Akron, Ohio, on Oct 15 by Willis Sperry, who broke O'Meara's week-old record of 46 loops In Germany Kurt Schmidt of Koenigsberg University remained aloft 36 hours, 25 minutes, breaking the record set by Lieutenant W A Cocke, Jr, in Hawaii in 1931

Personnel

Retiring as a partner in Hayden, Stone & Company, members of the New York Stock Exchange, Richard F Hoyt was elected vice-president of the Heystone Securities Corporation, which is engaged mainly in underwriting securities. Among the large number of companies in which Mr Hoyt is a director are Atlantic, Gulf and West Indies Steamship lines, Bendix Aviation Corporation, Curtiss-Wright Corporation, International Cement Corporation, Pan American Airways, and the Thompson Starrett Company, Inc

Samuel Solomon of Washington, D C, who is associated with Amelia Earhart Putnam and Paul Collins in National Airways Company, operating subsidiary of the Boston and Maine Railroad, has been elected to the offices of vice-president and general manager of Washington airport and also to important positions in National Airport Corporation and National Airlines

Joseph W Brennan, formerly traffic head of Transcontinental and Western Air's eastern region, has been made general traffic manager, succeeding T B. Clement, vice-president in charge of traffic who resigned Oct 1

H, W Beck, formerly western region traffic manager of Transcontinental and Western Air, has been promoted to the position of assistant general traffic manager for the entire TWA system with a territory extending from coast to coast

Kenneth Lane formerly connected with the Aeronautics branch, Department of Commerce, is now with the engineering department of the Chance Vought Corporation at Hartford, Conn

Employed since 1931 with the Curtiss-Wright Corporation at Robertson, Mo., Ray W Brown is now assistant sales manager of the aviation division of the General Tire Company

An omission

In the directory item devoted to the Scintilla Magneto Company on page 268 of the September, 1933, issue of AVIATION, the association of the Scintilla company, as a subsidiary, with the Bendix Aviation Corporation was omitted.

SIDE SLIPS

By Robert R. Osborn

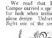
IT IS FORTUNATE for the aircraft industry that real improvements develop fast enough that airplanes become obsolescent in a few years—as the actual machines never do wear out—that is, they never wear out beyond the point where a good barnstorming pilot and mechanic could put them in good operating condition with a few fence rails and flour sacks Every "old timer" remembers the Jennies which lay in their leaky packing cases in open fields for years before they were sold for many more years of good flying Now we read that Admiral Byrd is taking down

a Cyclone engine to replace the nose engine of his Ford monoplane, which has been buried in the snow for a couple of years—the Whirlwind wing engine being expected to be in first class condition It will be a sad day for the airplane business when we have to follow the automobile practice of adding an extra horn or slightly changing body lines in order to sell new ships

Mrs Mollison, after traveling all around the United States on our airlines, has paid us the compliment of stating that our air transport and commercial flying are two years ahead of the European services We appreciate the compliment and don't wish to detract from it by quibbling however, we often wonder how one arrives at estimates of time like this one Two years ago our airlines weren't even started, comparatively speaking, when one considers the great strides they have made today. Who can say that, with a bit of diligent study and intelligent purchases of new equipment, the European air transport couldn't be placed "a year ahead" of ours, within three months We have no mathematical mind, nor do we have a fad for accuracy, but some types of guesswork go against the grain. For instance, when we build our beautiful country estate we shall name it "38¾ Acres" None of them "40 Acres" stuff for us! (Or to be really accurate, one friend claims we may have to name our estate "⅛ Acres," when we finally do get one)

With the Roosevelt Field National Air Pageant in bankruptcy it seems that *Liberty Magazine* picked the wrong terminus for their famous Treasure Hunt

We read that Flight Lieutenant Comper carried a sprig of white heather for luck when testing his newest airplane design Unfortunately during the flight one of the seeds of the heather



flew into his eye so that he had to fly blind for fifteen minutes before he could remove it. We have always claimed that in carrying luck pieces one should specify the kind of luck desired, unless one is a believer in the old saying that "Bad luck is better than no luck at all"

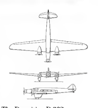
FLYING EQUIPMENT

The British Comper "Mouse"

THE Comper "Mouse" represents a type of airplane which, although not having received much attention so far in this country, is very popular abroad. European private owners indulge in a type of flying which the French sum up in a single word *tourisme*, a word that implies a week-end trip to the Riviera, a dash up into Scotland for a bit of grouse shooting or a midwinter run to St. Moritz for the skiing. Machines for such purposes must be relatively small, should have folding wings for easy storage, should be fast and economical, and comfortable withal for at least three people and their baggage.

The D-332 arrives at Croydon after setting a new cross-Channel speed record.

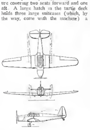
The "Mouse," designed by Flight Lieut. N. Comper, fits into such requirements. It is also adaptable to commercial taxi or feeder service. It is a three-seater, full cantilever, low-wing monoplane, powered by a 130-hp Gipsy Major engine. Passenger comfort is assured by a complete glassed-in enclosure covering two seats forward and one aft. A large hatch in the turtle deck holds three large suitcases (which, by the way, come with the machine) a small locker in the wing roots can be used for tools and log books.



The machine is entirely wood framed with fabric and plywood covering. Engine mount, retracting undercarriage and tail surface ribs are of steel.

The retracting gear is simple and apparently effective. Each wheel with rubber disk shock absorbing mounting is carried in a box-like structure of steel tubes hinged to the front spar of the wing stub. A lever system manipulated by a handle in the cockpit swings the wheels back into the wing or forward into the landing position, as required. An ingenious hinge and locking mechanism has been worked out for the folding wings. Ailerons are operated by a system of push rods which do not have to be uncoupled when the wings are folded and which do not require complicated adjustment when the wings are locked into place.

General specifications are: Length overall, 25 ft. 1 in.; span, 37 ft. 6 in.; height, 5 ft. 6 in.; width (with wings folded), 11 ft. 10 in.; weight, empty, 1,300 lb.; useful load, 915 lb.; gross weight, 2,215 lb.; wing loading, 12.9 lb. per sq.ft.; power loading, 17 lb. per horsepower.



The Comper "Mouse"

The Dewoitine D-332 Transport

REPRESENTING the last word in machines for long-range transportation of passengers in the Far East as interpreted by French designers, the Dewoitine D-332 offers an opportunity to compare current design practice with American transport machines recently described in these pages. In general French and American designers at the moment show a common trend toward the all-metal low-wing monoplane as contrasted with the tenacity with which British manufacturers stick to the biplane and the Holland-built Fokkers to the high-wing monoplane type. The American leaning toward the two-engined arrangement, however, is not in evidence. Obviously Air Orient believes that safety lies in greater power plant subdivision for routes where airplanes must fly over dangerous terrain (cf. KLM machines for similar service AVIATION, February, October, 1933) for many days without benefit of shop servicing. The three Hispano-Suiza 9V engines have a total rating of 1,950 hp. Two engines are mounted in leading edge nacelles and one in the nose. All three carry cowls of the full NACA type and Levasseur-Reed all-metal propellers are fitted.

With full load (20,570 lb.) the machine showed a top speed of 187 m.p.h. cruising at 156 m.p.h. Its normal range at cruising speed is 1,250 miles. With one engine cut an altitude of 9,750 ft. can be maintained. Marcel Doret, while testing the D-332, set four new world's records for range and speed with heavy loads (see AVIATION, October, 1933).

In general outline, the ship differs materially from the new American transports in that the wing is of unusually high aspect ratio and the fuselage is very long and relatively narrow. The tail surfaces, therefore, are comparatively small. The fuselage is approximately rectangular for its full length, an arrangement which yields maximum cabin headroom and simplifies construction materially. It is of a semi-monocoque pattern with four principal longerons tying together a series of light bulkheads, the whole covered with a stressed skin of smooth sheet Vedal (a composite aluminum alloy sheet similar to Alclad). The wings are of the monospar type, with one large tapered box girder running full length through the region of maximum wing thickness. Ribs are cantilevered out from the girder and the whole covered with a smooth skin of Vedal. Ailerons are conventional, and trailing edge flaps are mounted between the ailerons and the fuselage. The engine mountings are of chrome nickel steel tubing.

The main landing gear is built in two independent units, each one installed under an outboard engine. No retracting gear is provided, but full streamline housings similar to those seen on the American-built Northrops are employed. As is common in European practice, the landing wheels are unusually large. Shock absorbers are oleo-pneumatic.

For service in the Orient, accommodations are provided for eight passengers only. The crew consists normally of two pilots and a radio operator.

The general characteristics of the ship are: Length overall, 61 ft. 7 in.; span, 94 ft. 3 in.; wing area, 1,014 sq.ft.; weight empty, 11,616 lb.; payload, 2,640 lb.; gross weight, 20,570 lb.

Preview of Stinson's Model A Airliner.

A Late Pursuit, the Boeing Fighter

THE influence of civil aircraft design on the military is again in evidence in the Boeing pursuit. The best of recent racing practice has been combined with military requirements.

The metal monocoque fuselage with its smooth skin and extraordinary absence of unfaired projections, represents probably the nearest approach to the optimum streamline shape that has so far been attained. The wing and undercarriage arrangement follows closely that common in recent low-wing racing monoplanes, that is, the metal covered wing panels and the main landing gear supports are carried by short wing stubs built as an integral part of the fuselage proper. A system of streamline wires whose members are all in tension provides lateral bracing for both wing and undercarriage.

Ailerons and rudder are of the conventional unbalanced type but the elevator is provided with overhung balancing. The stabilizer is fixed, but longitudinal trim is obtained by means of trailing edge flaps on the elevators. A similar arrangement is in use on the latest Boeing transport. A supercharged Pratt and Whitney Wasp engine provides the motive power.

The P X W Wasp-powered Boeing pursuit.

Pilot vision is exceptionally good for pursuit purposes. The cockpit is located well forward and high up on the fuselage, permitting a practically unobstructed view ahead, above, and to the rear.

Stinson Model A Airliner

ALTHOUGH details are lacking at the moment, it has been announced that the Stinson Aircraft Corporation has under construction a new high-speed transport with accommodations for eight passengers and two pilots. The plane will be powered with three tractor engines, one in the nose and two in the nacelles built into the leading edge of the wing. The main landing wheels will retract into the under part of the nacelles.

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With Foreign Builders

Continuing our policy of offering brief summaries of current European airplanes and engines.

WITH war clouds again hanging low over Europe, the air services of the several Powers are naturally not exhibiting their latest wares publicly. By combing through current issues of the foreign technical press, however, sufficient information comes to light to indicate some general trends of military thought.

British interest is still strong in the interceptor type, single-seat, high-performance fighter for night-and-day service. Two recent examples, both biplanes of conventional form powered by air-cooled radial engines, are the Armstrong-Whitworth XVI—A-2 and the Gloster S.F. 19B, both machines having top speeds of well over 200 m.p.h. The Fairey Firefly and the Hawker Super-Fury, although of older design, are also in this class. For heavy bombing the Handley-Page Heyford has created considerable interest. This is a two-engined biplane characterized by a fuse-

lage which intersects the top wing, and with the landing gear built into the lower wing. This machine shows a very high performance and an unusually good field of fire in all quadrants. A three-engined version of the Handley-Page "Hercules" class has also been developed for bombing and troop-carrying. For the naval arm, flying boats of extraordinary dimensions seem to be the order of the day. Both Short Brothers and the Blackburn Aeroplane and Motor Company, Ltd. have produced such types recently. The Short machine is a biplane flying boat with a gross weight of over 70,000 lb., and powered by six 825-hp. Rolls-Royce engines is said to be the largest service seaplane in the world. More recently production models of the Supermarine "Southampton" to be known as the "Scapa" have appeared. Considerably smaller than the Short boat, the Scapa biplane is powered with two Rolls-Royce "Kestrels."

In France, one research for a high performance fighter led to a very radical departure from the conventional in the Hanriot-Biche 110C1. This low-wing monoplane is of the pusher type with a 600-hp. liquid-cooled engine fitted with a three-bladed propeller behind the pilot seat. Tail surfaces are supported on a pair of booms (this machine fully described in NACA Aircraft Circular No. 182). A high-performance, single-seat fighter for the Navy has lately been turned out by Le Société Bernard. This is a mid-wing cantilever-type monoplane with fuselage of circular section powered by a radial air-cooled engine and mounted on twin floats. Handley-Page slots and flaps have been fitted.

Czechoslovakia has a new single-seat fighter, the Letov S 231. This machine shows the influence of British fighter design practice and is powered by a Bristol Mercury engine. It carries four machine guns mounted in the upper wing and firing forward. It has shown a top speed of 214 m.p.h. at 16,000 ft.

Among Italian military machines which have appeared since the writing of the articles on the Italian military air forces by Major Scaroni (AVIATION, October, November, December, 1931) are the Romeo RO-5 Reconnoissance and the Fiat CR30 fighter. The former is a cabin-type sesqui-plane for three persons powered with a 550-hp. Piaggio-Jupiter engine, air-cooled. The other machine follows the general trend of Italian military design in that it is a biplane (with characteristic W struts) powered by a water-cooled Fiat A30 engine of 650 hp. In this machine two Italian officers, Captain Baldi and Lieutenant Buffa made an average speed of 190 m.p.h. between Rome and Bucharest competing for the Bibesco trophy.

WHAT OUR READERS SAY

The Private Pilot Speaks

TO THE EDITOR:

I have just read your editorial on the private pilot in the last issue of AVIATION, and as a private pilot, I would like to express my great appreciation of the clear and convincing way in which you have expressed the reasons why we should be free from the nuisance of many of the regulations which are rightfully applied to commercial pilots and commercial aircraft.

A. R. STEVENSON, JR.
Schenectady, N. Y.

TO THE EDITOR:

Congratulations on your editorial comment, "Lo, the Poor Private Pilot." That hits the nail on the head. (July issue of AVIATION). And why have a commercial license on an airplane to be flown non-commercially?

I hope you keep up the good work.

C. T. BURNETTE
New Franklin, Mo.

TO THE EDITOR:

I have just read your editorial "Lo, the Poor Private Pilot" on page 217 of the July issue of AVIATION. I believe you have expressed the sentiment of nearly every airplane owner who flies for pleasure. It is certain that some relief must be secured along the lines you suggest before private flying will reach the development that it justly deserves. I hope the manufacturers and some of the aviation organizations will follow your lead in this important matter.

R. U. ST. JOHN
Alameda, Cal.

TO THE EDITOR:

Your editorial on the plight of the private flyer seems to me to be the best I have read on the subject. I think the crux of your comments is contained in your last statement in which you say regarding reduction of requirements: "We believe that the Department would consider such a change with an open mind, and we believe that it can be accomplished if the aircraft industry and the private owners of aircraft will get together and show a little interest in the subject."

Private owners and small operators are everywhere complaining bitterly but they have had neither money nor leaders. They are widely scattered and by nature individualistic, as are all pioneers. Let the development section of the Department help get them together. The time is ripe and they would perhaps feel for the first time that the Aeronautics Branch was their servant. So it should be instead of their lord and master, as it has been no doubt without realizing it. We will have a lot to propose if the development section of the Aeronautics Branch will help us get together so that we can express ourselves and most of it will be mighty constructive.

DEAN R. BRIMHALL
Ogden, Utah

TO THE EDITOR:

I wish to take this opportunity to commend your editorial in the July issue "Lo, the Poor Pilot." It is well taken and I hope will be continued. This flying game has been a high priced pleasure. The equipment has been expensive. Many of our present rules makers had their training and experience in craft paid for and operated by others, such as the military services. How many own and operate their own craft out of their own pockets, state directors included? This results in a disregard for the private operator and the criticized rules.

I have complained to the Department of Commerce suggesting an intermediate class of aircraft licenses; one intermediate between the full commercial and the identified which latter is now barred from many states completely. This new class would be airworthy (such as A.T.C.) and inspected, but of more lenient rules and simpler piloting requirements. Furthermore why cannot the government inspector conduct all subsequent physical examinations as are necessary after the first one. Thus the cost is zero. The sight and mentality are the two chief requirements. The inspector might have the right to require an M.D.'s O.K. in questionable cases.

Not until the rules are simpler, the costs lower will aviation *really* boom. Where would our automotive industry be if dependent only on trucks and buses. It is the low priced private car which built the roads, service stations, etc.

I had an interesting visit at the plant of the Taylor Brothers Aircraft Corporation recently. They are really trying to help this development and will no doubt be glad to aid such a movement. If I can do anything on my part, I should like to help.

Such an intermediate aircraft class would have to be licensed for non-commercial operation to avoid the various state rulings now in force against "unlicensed aircraft." I suggest a "P" class.

ANDREW J. FAIRBANKS
Watertown, N. Y.

AIRCRAFT AT WORK

Selling tractors from the air

EXAMPLES of the usage of aircraft to sell products effectively continue to mount. R. L. Harrison, dealer for Caterpillar Tractors in the State of New Mexico, has piled up a steadily increasing sales total through a period of depression by a constant use of his Model E-4000 Travel Air biplane. It has been especially helpful in making contact with local governmental bodies whose job includes the purchase of road machinery. In New Mexico it is the practice to have all county commissioners' courts meet on the same day. Making use of his ship Mr. Harrison is able to attend a number of widely separated meetings, a feat otherwise impossible using any other means of transportation. A visit by a salesman in an airplane seldom fails to arouse the interest of the commissioners.

A modern salesman makes his rounds.

Gold diggers of 1933

CONTRARY to popular opinion most of the gold of the world is not dug on Broadway, but in more remote localities far more difficult of access. For the small producer with pick-ax and pan, the transportation of equipment is no great problem, but modern large scale operations require machinery and power. Mining machinery and power plant equipment fall definitely in the "heavy" classification and to transport them in quantity into gold-bearing regions would be an impossible task in many cases without help from the airplane.

Heretofore the classic example of gold mining by air has been in the New Guinea Goldfield where hundreds of tons of dredging machinery were transported inland some 35 miles across impassable jungles. Through the courtesy of H. S. Reisenstein of the Westinghouse International Company an account has been received of another venture in Peru. Twenty years ago the discovery of extensive deposits of gold, copper and silver in the Mancahuria River basin in Southern Peru would have been of no consequence, because no means would have been at hand to transport the necessary equipment the 200 odd miles east from the port of Mollendo over the 19,000 ft. barrier of the Andes. Today, however, construction is under way of a modern hydroelectric station on the site capable of producing some 2,000 hp. to be used to drive the heavy machinery which follows the electrical equipment in over the air route.

The developers of this project, A. and F. Wiese, were assisted by the Pan-American Grace Line for the transportation of the equipment which was designed especially for the job by the Westinghouse Electric & Manufacturing Company. Due to the altitude of the landing field, and the height of the mountains along the route, it was necessary to limit the load in each airplane to 2,000 lb. The cabin space available in the Ford three-engine machines which were used was 3 ft. 6 in. x 5 ft. 8 in. x 8 ft. 3 in. and it was, therefore, necessary for the Westinghouse engineers to design all the equipment so that it could be dismantled into units to fit these limitations. The generating equipment was comparatively easy, although the rotor shaft just fitted into the space and weighed 1,980 lb.—only 20 lb. to spare. The transformers, however, were quite a different problem. It was impossible to fit the tanks into the space available so, after being built and tested, each tank was cut in half vertically with a torch, shipped to the site and the two halves electrically welded.

Westinghouse's kite balloon for radio experiments.

An aid to radio research

RADIO engineers have been making use of a small kite balloon to support a broadcasting station antennae at various altitudes above the surface of the earth. Their objective is to offset the ill effects on broadcast transmission introduced by the curvature of the earth's surface by putting the antennae high enough into the air so that waves may travel in straight lines direct from transmitter to receiver. The small balloon has been obtained for preliminary experiments. If these prove successful, it is planned to obtain a large one and carry the research into higher altitudes.

THE BUYERS' LOG BOOK

AVIATION'S *Card Index of New Equipment*

This department is equipped to help readers locate manufacturers of any parts, accessories or materials

ENGINE ACCESSORIES — **Battery ignition**

*United American Bosch Corporation,
Springfield, Mass*

COMPLETE equipment for changing over aircraft engines from magneto to battery ignition offered. All replacement units designed to fit S.A.E magneto and generator mounts so change can be made on existing engines Twin units available for engines having no generator mounting so that unit replaces one magneto and generator the other Complete auxiliary equipment also available

AVIATION, *November, 1933*

HAND TOOLS — **Screw drivers**

*The Stanley Works,
New Britain, Conn.*

NOVEL TYPE of screw driver designed especially for ignition system work just announced Handle is of transparent unbreakable material containing a built-in neon tube which flashes orange light when tip of screw driver is placed on terminal of a firing spark plug or other element of ignition system, radio or x-ray set, etc Blade 4x⅛ in Cat No 1011

AVIATION, *November, 1933*

LABORATORY EQUIPMENT — **Hydrometer**

*C J Tagliabue Manufacturing Company,
Park and Nostrand Avenues, Brooklyn, N. Y.*

DESIGNED for oil testing laboratories, new Tag certified hydrometer has novel features including streamline tip for easy cleaning, solid metal ballast, a metal scale with open graduations, built-in thermometer, double gravity scales All scales yellow with black lettering, mercury red, making contrast for quick reading May be had with or without thermometers.

AVIATION, *November, 1933*

PARTS — **Elastic stop clinch nuts**

*A G A Company, (Elastic Stop-Nut Division)
Elizabeth, N J*

FURTHER application of the Stop-Nut principle intended for use where a tapped hole is required in sheet metal too thin for tapping Nut has tapered shank which is riveted to sheet with a punch and dolly or squeezer tool Available in three machine screw sizes with six shank lengths per size Useful in aircraft for holding skin to structure, installing fairings, panels, etc

AVIATION, *November, 1933*

PARTS — **Screws, self tapping**

*Kellog Switchboard and Supply Company,
1066 West Adams Street, Chicago, Ill.*

ANNOUNCEMENT made of a new self tapping machine screw, the Tapster, designed to replace ordinary machine screws in steel, non-ferrous metals, ebony, bakelite, etc Cuts own thread in standard machine screw sizes, and may be retracted and redriven without harm Each screw is fluted like an ordinary tap and has two cutting edges Can be hand or machine driven All standard styles

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SHOP EQUIPMENT — **Grinder, portable electric**

*Chicago Wheel and Manufacturing Company,
1103 West Monroe Street, Chicago, Ill.*

NEW high speed portable grinder designed especially for touching-off parts, sharpening and finishing tools, dies etc Compact, light, designed to be held in hand. Universal motor for 110 volt AC or DC operation fitted with dust proof ball bearings Speeds up to 17,000 r.p.m Grinding wheel held in case hardened chuck Over 100 wheel shapes available Three furnished with tool

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SHOP EQUIPMENT — **Tube bender**

*Schotz Manufacturing Company,
Poughkeepsie, N. Y.*

THE Climax tube bending machine is offered in either hand or motor driven types for bending steel and non-ferrous tubes or pipe up to 8 in and 10 in diameters respectively Bends are made cold. Special mandrels and automatic machine release are features Where materials will stand the deformation, bends can be made down to one or two times tube O.D either right or left hand

AVIATION, *November, 1933*

SHOP EQUIPMENT — **Vises, protected jaw**

*Wolverine Industries,
Harbert, Michigan*

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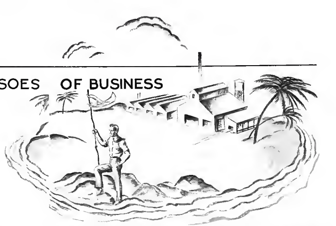

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Before me a Notary Public in and for the State and county aforesaid personally appeared H. R. Putnam who having been duly sworn according to law deposes and says that he is the Secretary of the McGraw Hill Publishing Company Inc. publishers of Aviation and that the following is, to the best of his knowledge and belief a true statement of the ownership management (and if a daily paper the circulation) etc. of the aforesaid publication for the date shown in the above caption required by the Act of March 3 1933 embodied in section 537 Postal Laws and Regulations printed on the reverse of this form to wit

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